PRICE $2.00

HEATH COMPANY · BENTON HARBOR, MICHIGAN

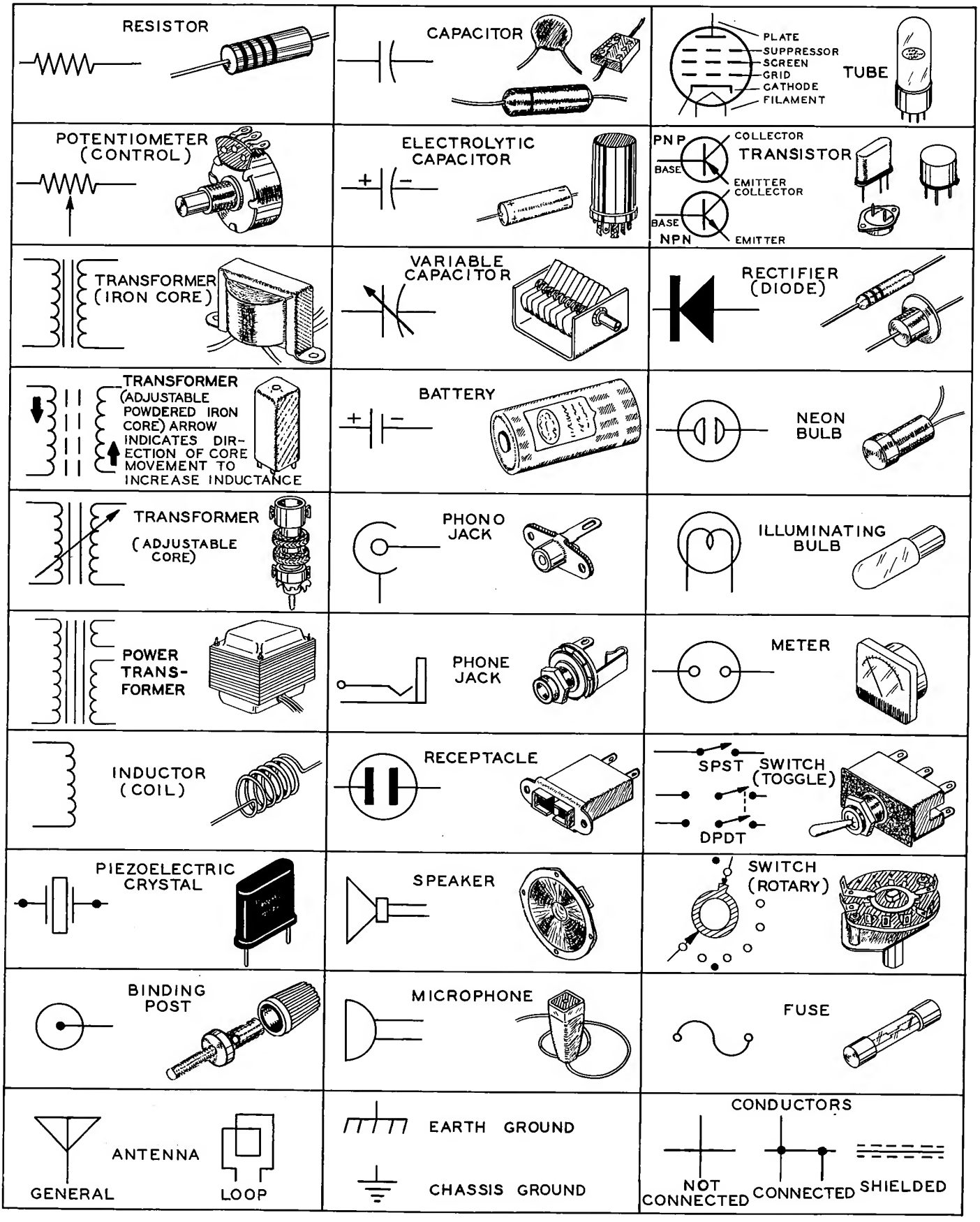
HEATHKIT®
ASSEMBLY MANUAL

SOLID-STATE SSB RECEIVER
MODEL SB-303

595-1124

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



Assembly

and

Operation

of the

HEATHKIT®

SOLID-STATE SSB RECEIVER

MODEL SB-303

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

TABLE OF CONTENTS

INTRODUCTION

The Heathkit Model SB-303 Solid-State SSB Receiver is designed to receive SSB, CW, RTTY, and AM signals on all amateur bands between 3.5 and 30 MHz. It will also receive WWV at 15 MHz for an accurate calibration signal. State-of-the-art solid-state circuitry provides the ultimate in stability, selectivity, and sensitivity.

Separate AM and CW crystal filters can be obtained. These crystal filters are switch-selected from the front panel for these two modes of operation to assure optimum selectivity and performance. If these optional filters are not obtained, AM signals are received by zero-beating the carrier and CW may be received in either SSB mode.

The preassembled, prealigned solid-state LMO (linear master oscillator) and crystal-controlled heterodyne oscillators assure stable and ultra-linear tuning with a calibrated dial readout in 1 kHz increments. An intergrated circuit crystal calibrator provides markers every 100 kHz or 25 kHz.

Modular plug-in Switch-Boards* and circuit boards provide easier-than-ever constructions and servicing. Special extender boards are included to allow easy Switch-Board and circuit board access for in-circuit voltage and resistance measurements. The all solid-state circuitry includes twenty-eight silicon transistors, four of which are MOS FET's (metal-oxide semiconductor field-effect transistors). One integrated circuit is also included.

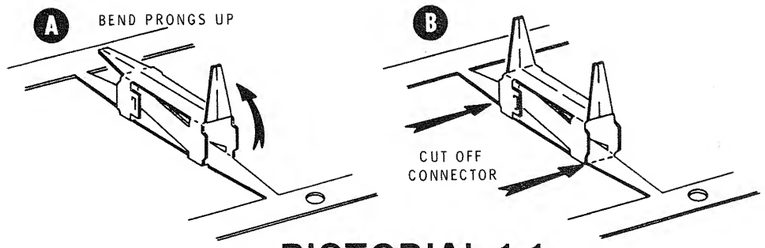
Other features of this Receiver are special antenna and power connections for VHF converters; smooth, virtually backlash-free dial tuning; and provisions for transceive operation with SB-400 Series Transmitters.

Complete RTTY/FSK circuitry is included for operation in the RTTY mode with future Heath equipment. A transistor-regulated power supply provides stable supply voltage to all oscillators under varying line voltage and load conditions.

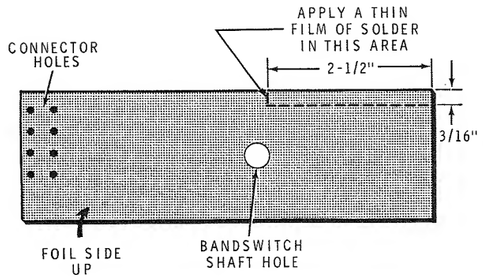
An 11 megohm input VTVM is required for the alignment of this kit.

Refer to Page 4 of the Manual for complete unpacking instructions. Refer to the "Kit Builders Guide" for additional information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

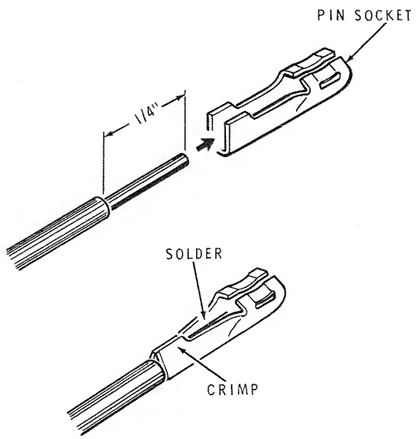
*Registered Trademark, Heath Company



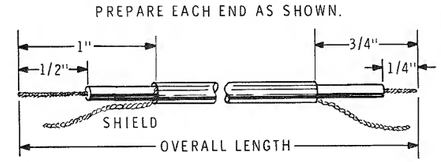
PICTORIAL 1-1



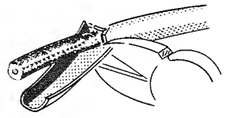
PICTORIAL 1-2



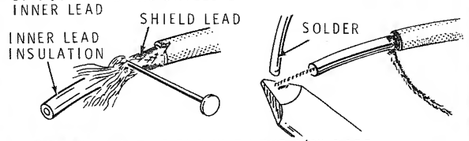
PICTORIAL 1-4



TAKING CARE NOT TO CUT THE OUTER SHIELD OF VERY THIN WIRES, REMOVE THE OUTER INSULATION.



USE A NAIL TO SEPARATE THE WIRES OF THE SHIELD. REMOVE THE INNER INSULATION AND TWIST THE SMALL WIRES OF THE SHIELD LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE SHIELD LEAD AND THE END OF THE INNER LEAD



AT THE END WITH THE 1/2" BARE INNER LEAD, INSERT THE INNER LEAD THROUGH THE PLUG AND WRAP THE SHIELD AROUND THE PLUG.

APPLY HEAT TO THE TIP OF THE PIN ONLY LONG ENOUGH FOR THE SOLDER TO BE DRAWN UP INTO THE PIN BY CAPILLARY ACTION.

SOLDER THE SHIELD ONTO THE PLUG. USE CARE NOT TO MELT THE INNER INSULATION.

CUT OFF EXCESS WIRE FROM THE TIP OF THE PIN.

TO MAKE SURE EACH COAXIAL CABLE IS NOT SHORTED, CHECK IT WITH AN OHMMETER AS FOLLOWS: CONNECT THE OHMMETER LEADS TO THE BARE WIRE ENDS OF THE COAXIAL CABLE. FLEX THE COAXIAL CABLE WHERE IT ENTERS THE PHONO PLUG WHILE WATCHING THE OHMMETER FOR CONTINUOUS OR INTERMITTENT SHORTS. CORRECT ANY SHORTED CABLES BEFORE PROCEEDING.

PICTORIAL 1-3

UNPACKING INSTRUCTIONS

The Receiver packaging consists of the large shipping carton which contains small packages and a number of loose parts. Some of the smaller packages have numbers 1 through 5 stamped on them. After these five numbered packages have been removed from the large carton, the remaining parts will be considered to be package #6.

Package #6 consists of items too large to fit into the small packages and those items used in a number of assembly sections, such as the large metal parts.

Each of the six assembly sections of the Manual contains a parts list and step-by-step instructions. At the beginning of each parts list, you will be instructed which numbered package to open. You will also be directed to remove any parts from package #6 that are required to complete that assembly section. Disregard any numbers that are not on the parts list when more than one number is on any package or part in this kit.

NOTE: To avoid intermixing parts, do not open any of the parts until instructed to do so at the beginning of a parts list. Any part that is packaged in an individual envelope with a part number on it, should be placed back in the envelope after it is identified, until it is called for in a step.

To order replacement parts, refer to the "Replacement Parts Price List" and use the Parts Order Form furnished with this kit.

ANTENNA, RF AMPLIFIER, HETERODYNE OSCILLATOR, AND CRYSTAL SWITCH-BOARDS

PARTS LIST

Unpack package #1 and check each part against the following parts list. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 31). This parts package contains all the parts for the four Switch-Boards, except those required from pack #6.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS			
1	1-1	2	47 Ω (yellow-violet-black)
	1-42	1	270 Ω (red-violet-brown)
	1-9	2	1000 Ω (brown-black-red)
	1-18	1	5600 Ω (green-blue-red)
	1-20	1	10 kΩ (brown-black-orange)
	1-21	1	15 kΩ (brown-green-orange)
	1-22	2	22 kΩ (red-red-orange)
	1-60	1	68 kΩ (blue-gray-orange)
	1-26	1	100 kΩ (brown-black-yellow)
CAPACITORS			
Mica			
2	20-99	3	22 pF
	20-77	6	24 pF
	20-100	1	30 pF
	20-160	2	33 pF
	20-101	6	47 pF
	20-110	1	75 pF
	20-102	2	100 pF
	20-114	2	270 pF
Ceramic			
3	21-33	1	3.3 pF
	21-78	1	5 pF
	21-143	10	.05 μF
Phenolic			
4	28-1	1	2.2 pF (red-red-white)
RF CHOKES-DIODE-TRANSISTORS			
5	45-38	1	Choke
	45-43	1	Choke
6	56-56	1	1N4149 diode

NOTE: Transistors are marked for identification in one of the following four ways:

1. Part number.
2. Transistor type number.
3. Part number and transistor type number.
4. Part number with a transistor type number other than the one listed.

7	417-105	1	SE5023 transistor
	417-240	1	40673 transistor

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
COILS			
8	40-484	1	36 μH fixed inductor (orange-blue)
9	40-546	1	Tuned trap
10	40-969	1	Antenna (gray dot)
	40-970	1	Antenna (yellow dot)
	40-971	1	Antenna (black dot)
	40-972	1	Antenna (brown dot)
	40-973	1	Antenna (red dot)
	40-975	1	RF (green dot)
	40-976	1	RF (orange dot)
	40-977	1	RF (violet dot)
	40-978	1	Oscillator (blue dot)
11	40-974	1	RF (blue dot)
	40-979	1	Oscillator (red dot)
	40-980	1	Oscillator (gray dot)
	40-981	1	Oscillator (yellow dot)
	40-982	1	Oscillator (green dot)
CRYSTALS			
12	404-207	1	12.395 MHz
	404-208	1	15.895 MHz
	404-209	1	22.895 MHz
	404-210	1	29.895 MHz
	404-211	1	36.895 MHz
	404-212	1	37.395 MHz
	404-213	1	37.895 MHz
	404-214	1	38.395 MHz
	404-279	1	23.895 MHz

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
CONNECTORS			
13	432-77	16	Switch-board connector
14	432-120	1	Pin socket
15	432-121	6	Connector pin
16	434-186	3	Board phono socket
17	438-4	1	Phono plug
MISCELLANEOUS			
18	63-565	3	Switch wafer (red dot)
19	63-568	1	Switch wafer (green dot)
	340-8	1	Bare wire
	344-16	1	Large red wire
	344-56	1	Blue wire
	343-12	1	Small coaxial cable (RG-174/U)
		1	Solder
ITEMS FROM PACK #6			
	85-345-1	1	Antenna Switch-Board
	85-346-1	1	RF Amplifier Switch-Board
	85-347-1	1	Heterodyne oscillator Switch-Board
	85-348-1	1	Crystal Switch-Board
	597-308	1	Kit Builders Guide
	597-367	1	Registration Card
	597-260	1	Parts Order Form
		1	Manual (See front cover for part number.)

STEP-BY-STEP ASSEMBLY

Before you start to assemble this Kit, be sure to read the "Kit Builders Guide" for complete information on wiring, soldering, and step-by-step assembly procedures.

Components will be installed on the circuit boards in the following circuit board pictorials. Position all parts as shown. Follow the instructions carefully and read the entire step before performing the operation.

Use 1/2-watt resistors unless directed otherwise in a step. All resistors will be called out by their resistance value (in Ω, or kΩ). The color code will also be given for color-coded resistors. Capacitors will be called out by their type and capacitance value (in pF, or μF).

After completing each circuit board, check to make sure that all connections are soldered and that there are no solder bridges between adjacent foils. If you find a solder bridge, refer to the "Kit Builders Guide" for information on correcting it.

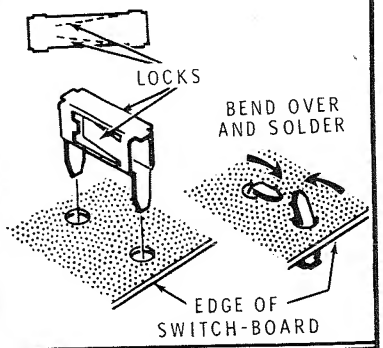
START

( ) Refer to Pictorial 1-1 (fold-out from Page 4) and prepare four connectors as shown.

( ) Locate the antenna Switch-Board (#85-345-1). Position the board with the connector holes to the left and prepare it as shown in Pictorial 1-2 (fold-out from Page 4).

( ) Position the antenna Switch-Board with the foil side down, as shown in Pictorial 1-5. Then complete each step on Pictorials 1-5 through 1-8.

NOTE: When installing a Switch-Board connector, insert the connector prongs through the Switch-Board so the locks of the connector are positioned as shown. Press the connector firmly against the Switch-Board, and bend the prongs against the Switch-Board. Then solder the prongs to the Switch-Board.

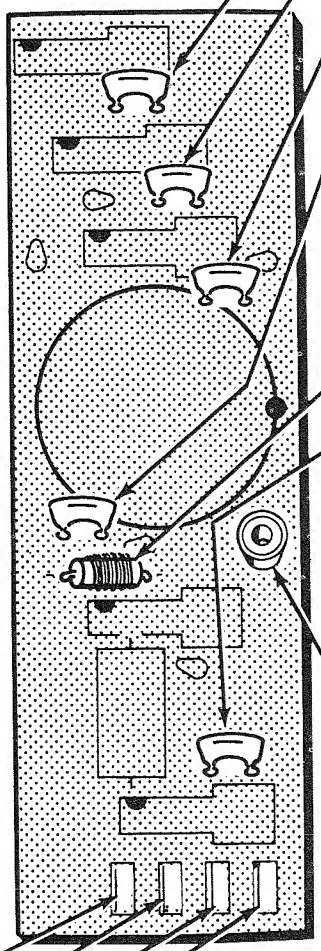


( ) Connector.

( ) Connector.

( ) Connector.

( ) Connector.



( ) 47 pF mica.

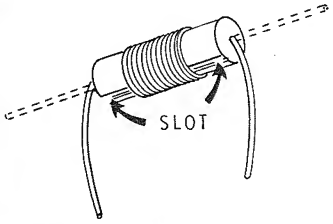
( ) 47 pF mica.

( ) 22 pF mica.

( ) 100 pF mica.

CAUTION: When bending and installing the choke in the following step, be careful when bending the leads toward the slot so the small coil wire does not break.

( ) Choke (#45-38).

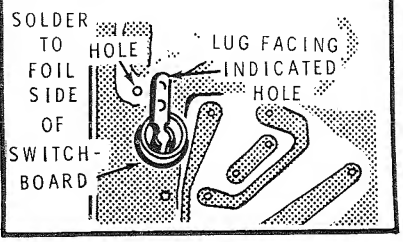


( ) 270 pF mica.

( ) Solder all connections and cut off the excess lead lengths.

NOTE: When mounting a board phono socket, seat the socket in the indicated hole with the lug positioned as shown. Place the circuit board foil side up on your work surface to hold the socket in position. Then solder the socket to the foil by gradually moving a soldering iron around the socket and foil while applying solder.

( ) Board phono socket.



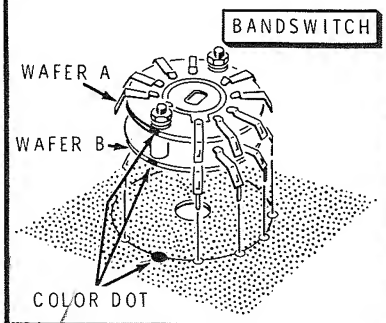
PROCEED TO PICTORIAL 1-6.

PICTORIAL 1-5

HEATHKIT

START

( ) Mount the switch wafer (green dot) on the Switch-Board making sure the color dots line up. Be sure to carefully insert the pins into the proper holes.

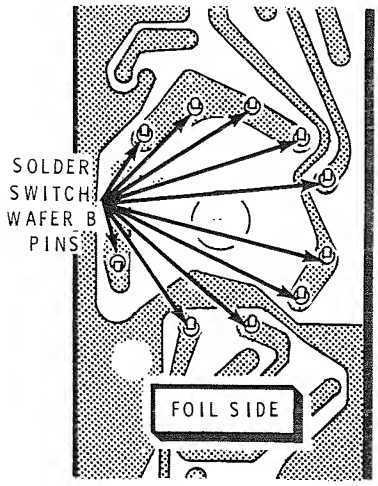


(✓) Solder all ten pins of switch wafer B to the foil. See Detail 1-6A.

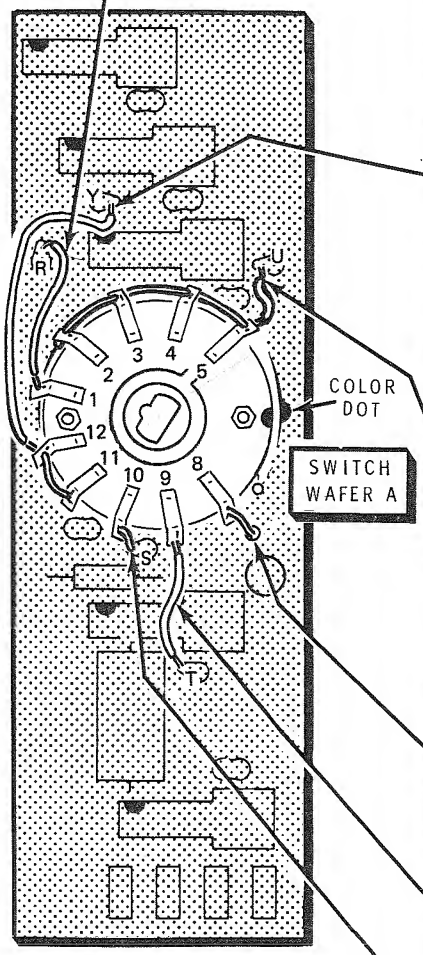
NOTE: To prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. If bare wire is called for, cut off a length of the supplied bare wire.

( ) Prepare the following lengths of wire:

3" blue	1" bare
1-1/4" blue	1-3/4" blue
2-1/2" blue	1" bare



Detail 1-6A



PICTORIAL 1-6

CONTINUE

(✓) Connect a 1-1/4" blue wire from lug 1 of switch wafer A (S-1) to Switch-Board hole R (S-1).

NOTE: When a wire passes through a connection and goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.

(✓) Remove an additional 1/4" of insulation from one end of the 3" blue wire. Insert this end through lug 12 (S-2) to lug 11 (S-1) of switch wafer A. Connect the other end of this wire to Switch-Board hole Y (S-1). Cut off any excess lead length from hole Y.

(✓) Twist the ends of lugs 2, 3, 4, and 5 approximately 1/4 turn.

(✓) Remove an additional 1-1/4" of insulator from one end of the 2-1/2" blue wire. Insert this end through lug 5 (S-2), lug 4 (S-2), and lug 3 (S-2) to lug 2 (S-1) of switch wafer A. Cut off any excess bare wire extending from lug 2. Connect the other end of this wire to Switch-Board hole U (S-1).

(✓) Connect one end of a 1" bare wire to lug 8 of switch wafer A (S-1). Insert the other end of the bare wire through the indicated hole; it will be connected later.

(✓) Connect a 1-3/4" blue wire from lug 9 of switch wafer A (S-1) to Switch-Board hole T (S-1). Push this wire down against the board.

(✓) Connect a 1" bare wire from lug 10 of switch wafer A (S-1) to Switch-Board hole S (S-1).

(✓) Check to be sure that the switch wafer A lugs are not touching any lugs on switch wafer B. If any lugs are touching, carefully bend them away from each other.

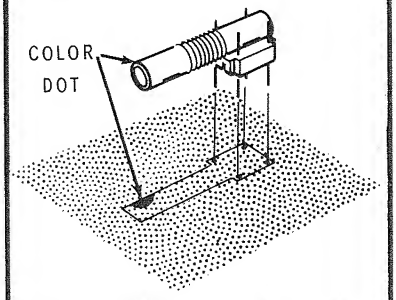
(✓) Check to see that all connections are soldered except the free end of the bare wire connected to lug 8. Cut off all excess lead lengths except the wire to switch lug 8.

PROCEED TO PICTORIAL 1-7.

START

NOTE: The coils have been pretuned at the factory. Do not attempt to further adjust the coils until instructed to do so.

When installing a coil on the Switch-Board, position the coil over its outline, making sure all four coil pins are inserted through their Switch-Board holes. Then solder each pin. The excess pin length does not have to be cut off. NOTE: Do not overheat the coil pins, as this could loosen them from the coil forms.



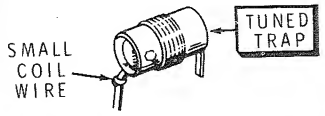
( ) Coil #40-972 (brown dot).

( ) Coil #40-971 (black dot).

( ) Coil #40-973 (red dot).

CAUTION: When preparing and installing the tuned trap in the following steps, be careful when bending the leads so the small coil wire does not break. Also, do not adjust the tuned trap. It is preset at the factory.

( ) Carefully bend the leads of the tuned trap #40-546.

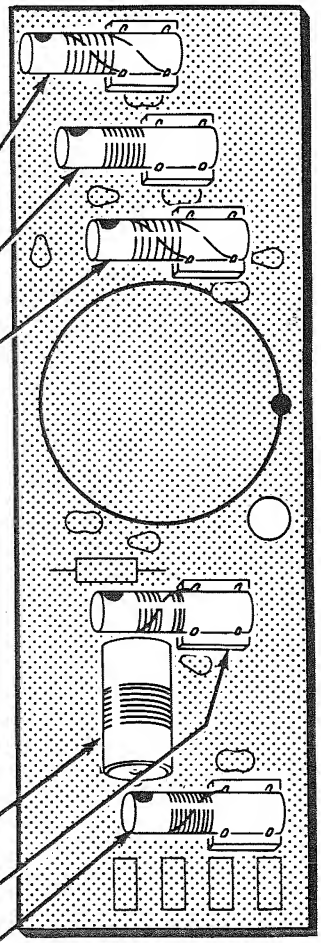


( ) Tuned trap #40-546. Solder both leads to the foil and cut off the excess lead lengths.

( ) Coil #40-970 (yellow dot).

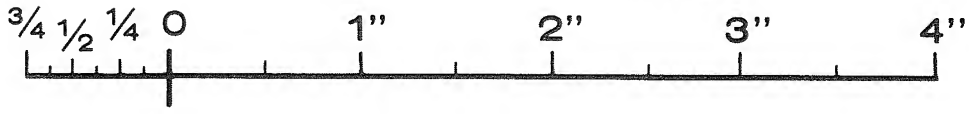
( ) Coil #40-969 (gray dot).

( ) Carefully inspect the foil side of the Switch-Board and solder any connections that might have been missed.



PROCEED TO PICTORIAL 1-8.

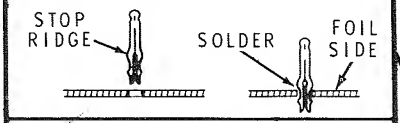
PICTORIAL 1-7



START

( ) Place the Switch-Board with the foil side up.

( ) Install and solder a connector pin in Switch-Board hole A.



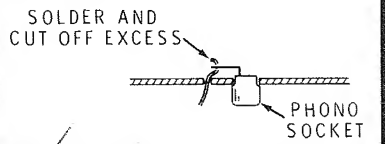
( ) Refer to Pictorial 1-3 (fold-out from Page 4) and prepare a 4" coaxial cable with phono plug.

( ) Cut the shield lead of the coaxial cable (end opposite phono plug) to 3/8" in length.

NOTE: When connecting wires to the foil side of a Switch-Board, do not push the insulation tight against the foil. Leave the insulation 1/8" away from the foil to insure a good solder connection between the foil and wire.

( ) Connect the inner coaxial cable lead to Switch-Board hole E (S-1). Then insert only 1/8" of the shield lead into Switch-Board hole F (S-1).

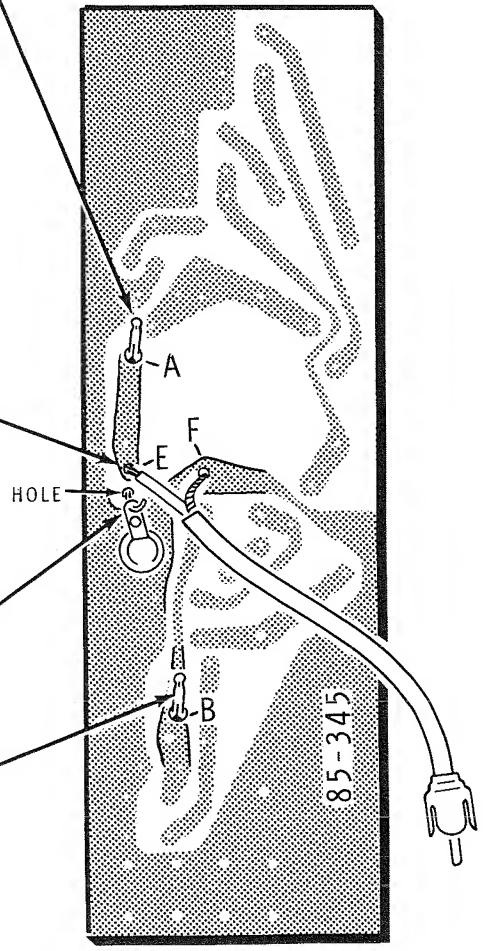
( ) Insert the bare wire coming from the indicated Switch-Board hole through the phono socket lug. Then bend the lug as shown. Solder the bare wire to the lug and cut off the excess wire length.



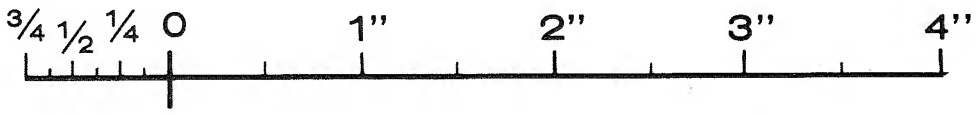
( ) Install and solder a connector pin in Switch-Board hole B.

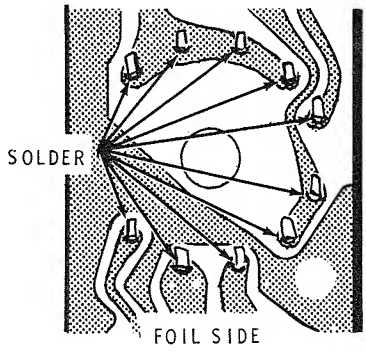
( ) Check to see that all connections are soldered and cut off the excess lead lengths on both sides of the Switch-Board. Set the completed Switch-Board aside until it is needed.

FINISH



PICTORIAL 1-8





START

( ) Locate the RF AMP Switch-Board (#85-346-1) and prepare it as shown in Pictorial 1-2 (Fold-out from Page 4). Position the board foil side up, connector holes to the left.

( ) Position the RF AMP Switch-Board with the foil side down, as shown in Pictorial 2-1. Then complete each step on Pictorials 2-1 and 2-2.

( ) Mount a switch wafer (red dot) on the Switch-Board, making sure the color dots line up. Be sure to carefully insert the pins into the proper holes.

( ) Solder all ten pins of the switch wafer to the foil as shown in the foil side view (above).

( ) 100 pF mica.

( ) 22 kΩ (red-red-orange).

( ) 24 pF mica.

( ) 30 pF mica.

( ) 10 kΩ (brown-black-orange).

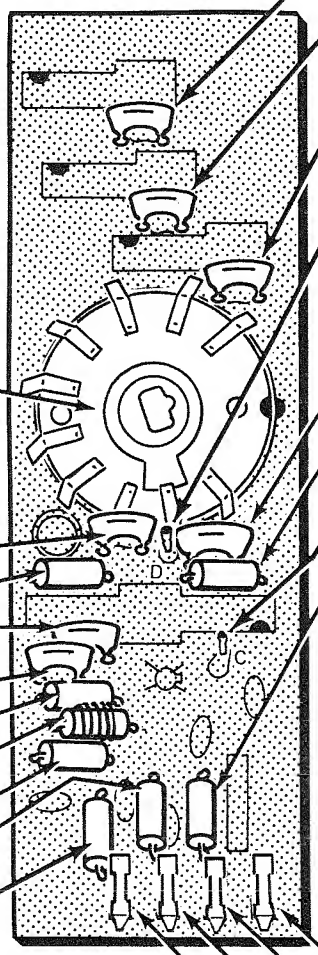
( ) Choke (#45-43).

( ) 270 Ω (red-violet-brown).

( ) 1000 Ω (brown-black-red).

( ) 68 kΩ (blue-gray-orange).

( ) Solder all connections and cut off any excess lead lengths.



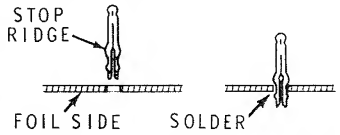
CONTINUE

( ) 47 pF mica.

( ) 47 pF mica.

( ) 22 pF mica.

( ) Install and solder a connector pin in Switch-Board hole D.



( ) 270 pF mica.

( ) 22 kΩ (red-red-orange).

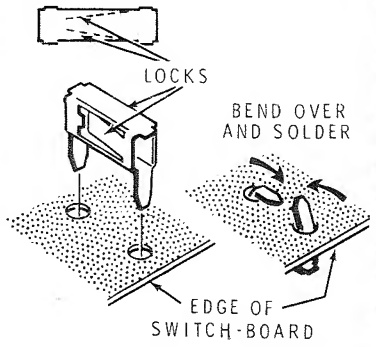
( ) Install and solder a connector pin in Switch-Board hole C.

( ) 47 Ω (yellow-violet-black).

( ) Solder all connections and cut off any excess lead lengths.

( ) Refer to Pictorial 1-1 (fold-out from Page 4) and prepare four connectors as shown.

NOTE: Bend and solder each connector as it is installed.



( ) Connector.

( ) Connector.

( ) Connector.

( ) Connector.

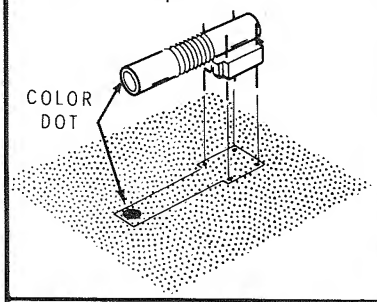
PROCEED TO PICTORIAL 2-2.

PICTORIAL 2-1

START

NOTE: The coils have been pretuned at the factory. Do not attempt to further adjust the coils until instructed to do so.

When installing a coil on the Switch-Board, position the coil over its outline, making sure all four coil pins are inserted through their Switch-Board holes. Then solder each pin. The excess pin length does not have to be cut off. NOTE: Do not overheat the coil pins.

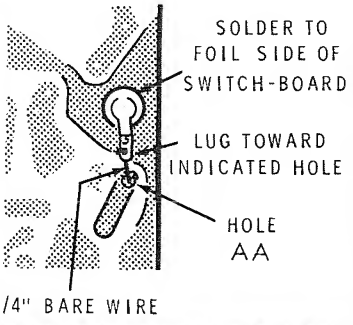


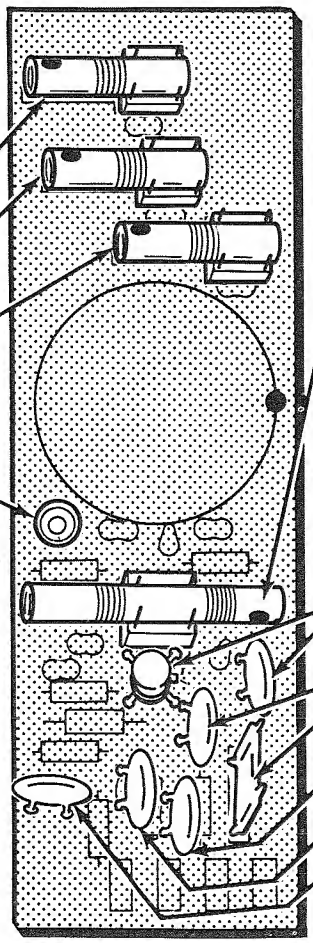
( ) Coil #40-976 (orange dot).

( ) Coil #40-975 (green dot).

( ) Coil #40-977 (violet dot).

( ) Board phono socket. Solder the socket to the foil side of the board. Then connect a 3/4" bare wire from the phono socket lug (S-1) to Switch-Board hole AA (S-1). Cut off the excess bare wire length on the other side of the Switch-Board.

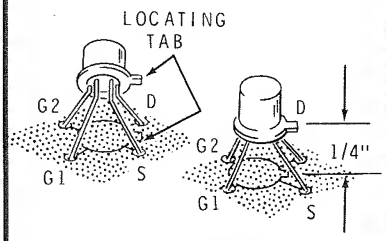




CONTINUE

( ) Coil #40-974, blue. Be sure to position the color dot as shown.

( ) Install the 40673 (#417-240) transistor in the following manner: Line up the tab of the transistor with the tab outline on the Switch-Board. Then insert the transistor leads into their Switch-Board holes, which are indicated by S, G1, G2, and D. Position the transistor 1/4" above the Switch-Board. Solder each lead to the foil and cut off the excess lead lengths.



( ) .05 μF ceramic.

( ) .05 μF ceramic.

( ) 36 μH fixed inductor (#40-484) orange-blue.

( ) .05 μF ceramic.

( ) .05 μF ceramic.

( ) .05 μF ceramic.

( ) Solder all connections and cut off any excess lead lengths. Set the completed Switch-Board aside until it is needed.

FINISH

PICTORIAL 2-2

START

( ) Locate the HET OSC Switch-Board (#85-347-1) and prepare it as shown in Pictorial 1-2 (fold-out from Page 4). Position the board foil side up, connector holes to the left.

( ) Position the HET OSC Switch-Board with the foil side down, as shown in Pictorial 3-1. Then complete each step on Pictorials 3-1 and 3-2.

( ) 33 pF mica.

( ) 24 pF mica.

( ) 24 pF mica.

( ) Prepare the following lengths of blue wire:

2" 1-3/4"

( ) Bend the bare wire ends of the 2" wire and insert each end into the indicated Switch-Board holes. Solder both ends of the wire to the foil and then press the wire against the Switch-Board.

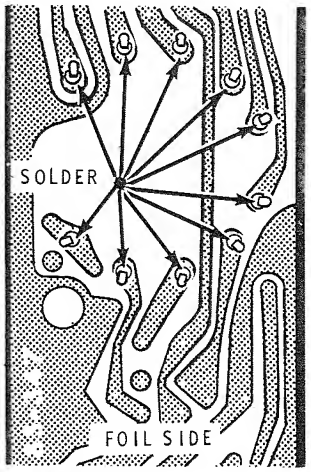
( ) Bend the bare wire ends of the 1-3/4" wire and insert each end into the indicated Switch-Board holes. Solder both ends of the wire to the foil and then press the wire against the Switch-Board.

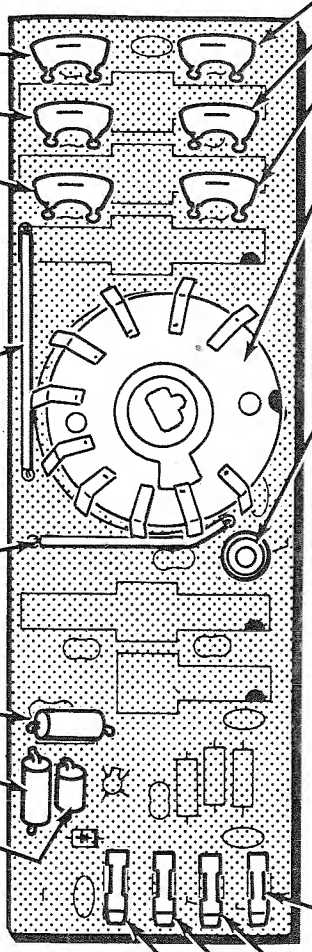
( ) 1000 Ω (brown-black-red).

( ) 100 kΩ (brown-black-yellow).

( ) 2.2 pF phenolic (red-red-white).

( ) Solder all connections and cut off any excess lead lengths.





( ) 24 pF mica.

( ) 24 pF mica.

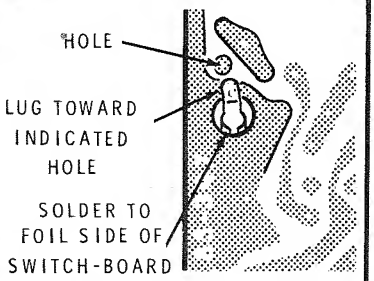
( ) 24 pF mica.

( ) Solder all connections and cut off any excess lead lengths.

( ) Mount a switch wafer (red dot) on the Switch-Board, making sure the color dots line up. Be sure to carefully insert the pins into the proper holes.

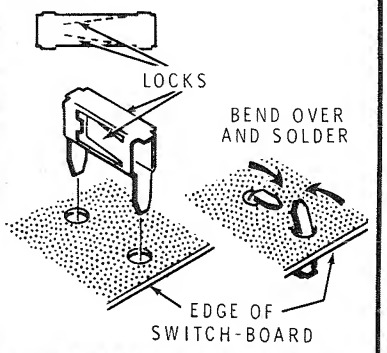
( ) Solder all ten pins of the switch wafer to the foil.

( ) Board phono socket.



( ) Refer to Pictorial 1-1 (fold-out from Page 4) and prepare four connectors as shown.

NOTE: Solder each connector as it is installed.



( ) Connector.

( ) Connector.

( ) Connector.

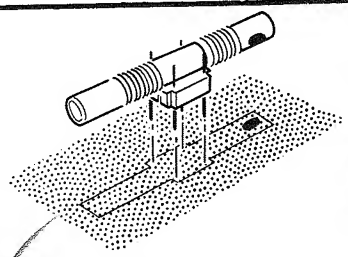
( ) Connector.

PROCEED TO PICTORIAL 3-2

PICTORIAL 3-1

HEATHKIT

START



( ) Coil #40-980 (gray dot). Be sure to position the color dot as shown.

( ) Coil #40-981 (yellow dot). Be sure to position the color dot as shown.

( ) Coil #40-982 (green dot). Be sure to position the color dot as shown.

( ) Coil #40-979 (red dot). Be sure to position the color dot as shown.

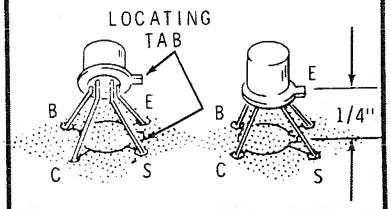
( ) 47 pF mica.

( ) Coil #40-978 (blue dot).

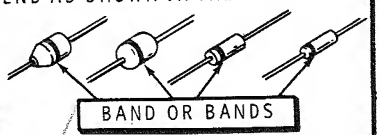
( ) 33 pF mica.

( ) Solder all connections and cut off the excess lead lengths.

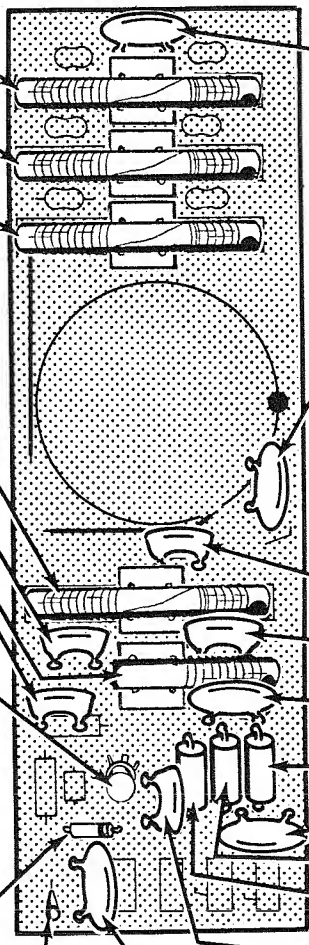
( ) Install the SE5023 (#417-105) transistor in the following manner: Line up the tab of the transistor with the tab outline on the Switch-Board. Then insert the transistor leads into their Switch-Board holes, which are indicated by S, C, B, and E. Position the transistor 1/4" above the Switch-Board. Solder each lead to the foil and cut off the excess lead lengths.



NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.



( ) 1N4149 diode (#56-56) at D101. Position the cathode end as shown.



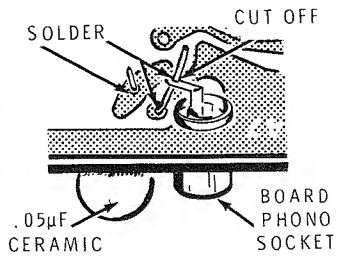
( ) Install a connector pin in Switch-Board hole TP.

( ) Solder all connections and cut off the excess lead lengths.

CONTINUE

( ) .05 µF ceramic.

( ) .05 µF ceramic. When installing the capacitor, insert the lead nearest the board phono socket through the socket lug. Then solder the lead to the Switch-Board foil and to the lug. Cut off any excess lead length.



( ) 47 pF mica.

( ) 75 pF mica.

( ) .05 µF ceramic.

( ) 47 Ω (yellow-violet-black).

( ) .05 µF ceramic.

( ) 15 kΩ (brown-green-orange).

( ) 5600 Ω (green-blue-red).

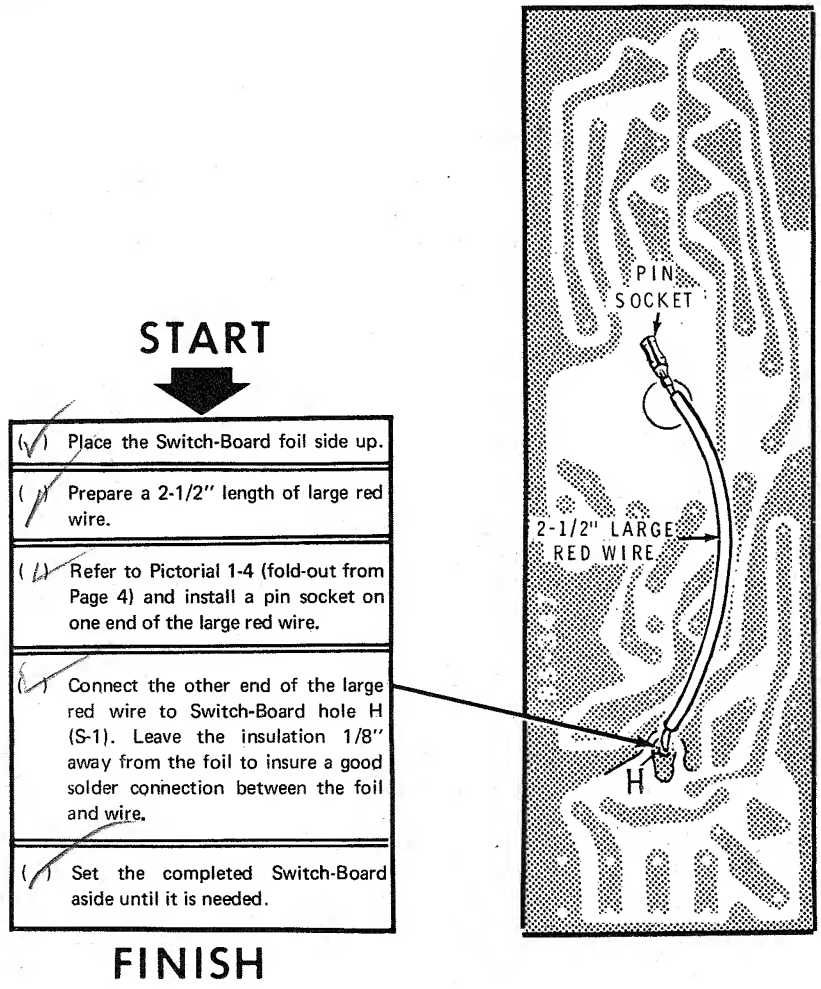
( ) 22 pF mica.

( ) .05 µF ceramic.

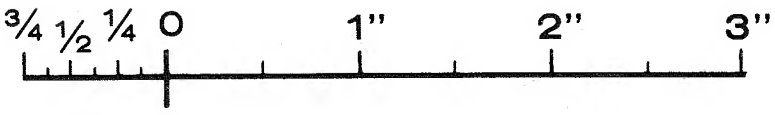
( ) Solder all connections and cut off any excess lead lengths.

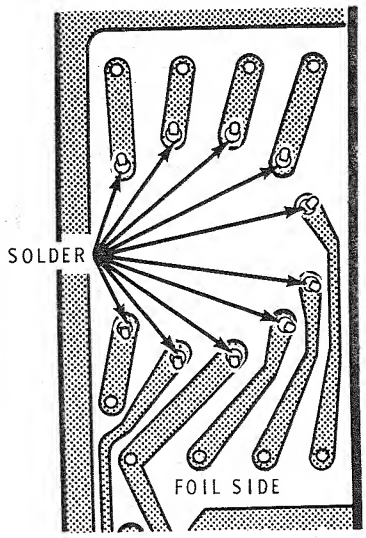
PROCEED TO PICTORIAL 3-3.

PICTORIAL 3-2



PICTORIAL 3-3





START

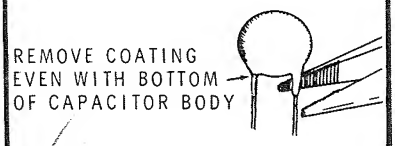
( ) Locate the crystal Switch-Board (#85-348-1) and prepare it as shown in Pictorial 1-2 (fold-out from Page 4). Position the board foil side up, connector holes to the left.

Position the crystal Switch-Board with the foil side down, as shown in Pictorial 4-1. Then complete each step on Pictorials 4-1 and 4-2.

( ) Mount the switch wafer (red dot) on the Switch-Board, making sure the color dots line up. Be sure to carefully insert the pins into the proper holes.

( ) Solder all ten pins of the switch wafer to the foil as shown.

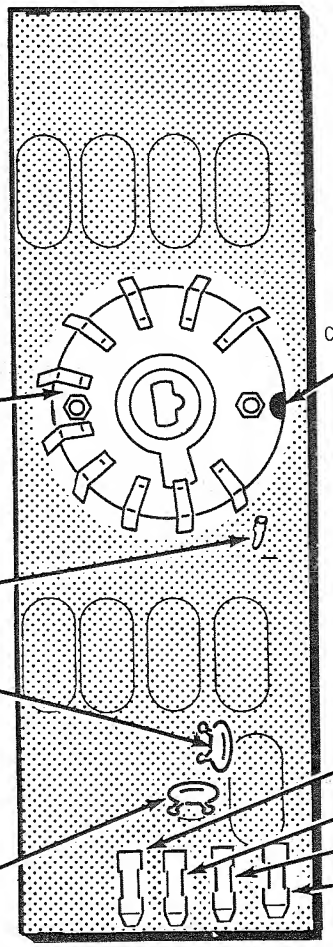
( ) Install a connector pin in Switch-Board hole XTAL.



( ) 3.3 pF ceramic.

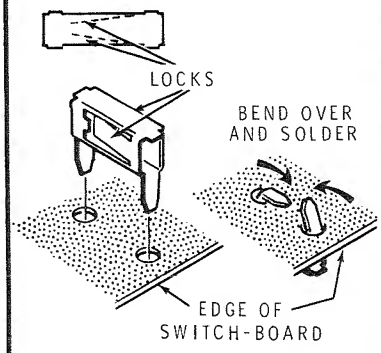
( ) 5 pF ceramic.

( ) Solder all connections and cut off any excess lead lengths.



( ) Refer to Pictorial 1-1 (fold-out from Page 4) and prepare four connectors as shown.

NOTE: Solder each connector as it is installed.



( ) Connector.

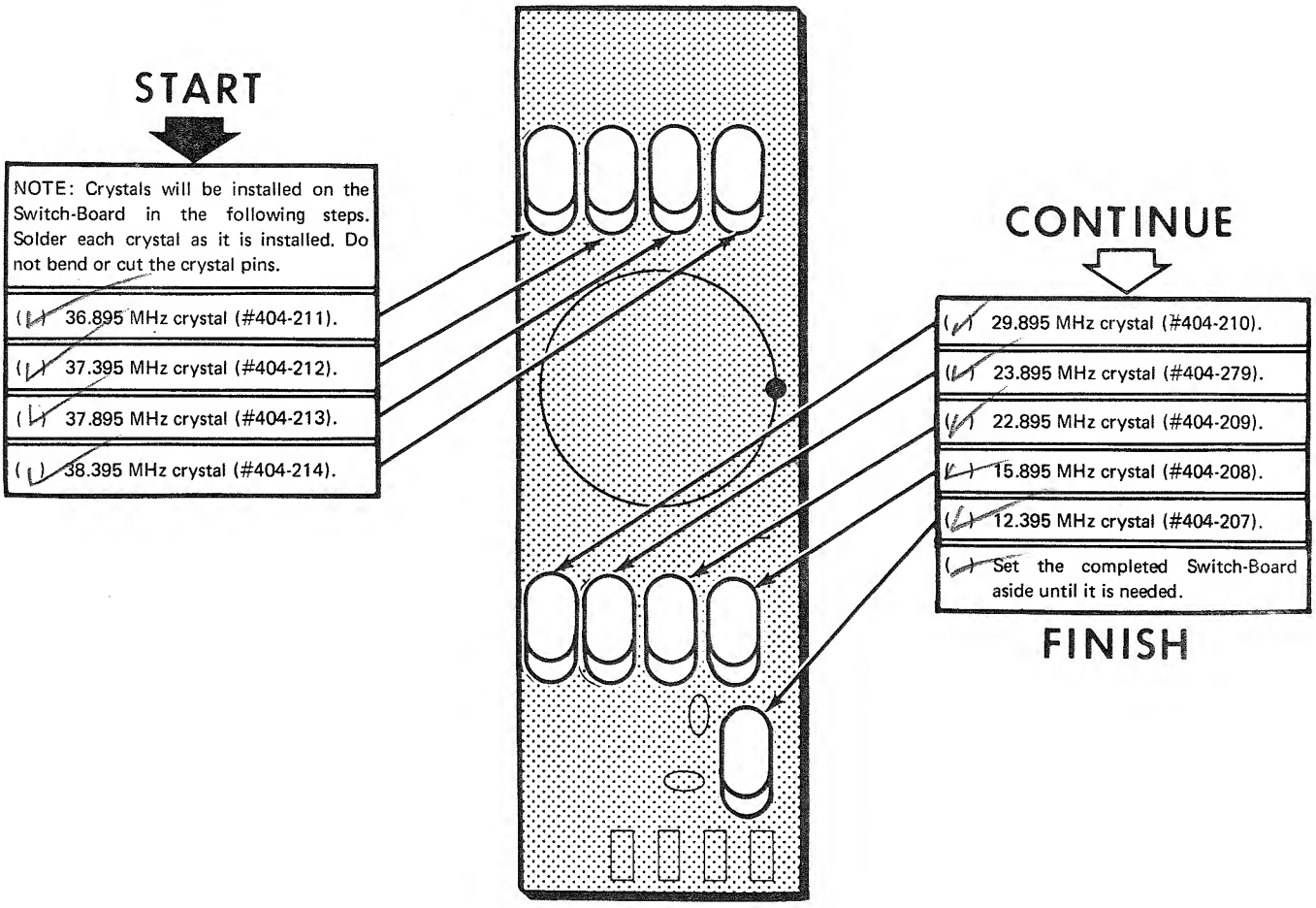
( ) Connector.

( ) Connector.

( ) Connector.

PROCEED TO PICTORIAL 4-2.

PICTORIAL 4-1



PICTORIAL 4-2

MIXER AND RTTY CIRCUIT BOARDS

PARTS LIST

Unpack package #2 and check each part against the following parts list. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 31). This parts package contains all the parts for the mixer and RTTY circuit boards, except those required from pack #6.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS			
1	1-1	2	47 Ω (yellow-violet-black)
	1-3	2	100 Ω (brown-black-brown)
	1-45	2	220 Ω (red-red-brown)
	1-42	1	270 Ω (red-violet-brown)
	1-7	1	680 Ω (blue-gray-brown)
	1-9	2	1000 Ω (brown-black-red)
	1-11	1	1500 Ω (brown-green-red)
	1-44	7	2200 Ω (red-red-red)
	1-16	3	4700 Ω (yellow-violet-red)
	1-73	5	8200 Ω (gray-red-red)
	1-20	1	10 kΩ (brown-black-orange)
	1-21	2	15 kΩ (brown-green-orange)
	1-25	2	47 kΩ (yellow-violet-orange)
	1-47	2	56 kΩ (green-blue-orange)
	1-27	2	150 kΩ (brown-green-yellow)
CAPACITORS			
Mica			
2	20-52	2	7.5 pF
	20-160	1	33 pF
	20-113	1	470 pF
	20-122	1	1000 µF
Ceramic			
3	21-3	1	10 pF
	21-46	1	.005 µF
	21-143	11	.05 µF
Other Capacitors			
4	27-73	2	.047 µF *Mylar

*DuPont Registered Trademark

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
DIODES			
5	56-56	2	1N4149 diode
6	56-67	1	Zener diode
Transistors			
7	417-118	3	2N3393
8	417-171	2	2N3694
9	417-240	2	40673
MISCELLANEOUS			
10	10-242	1	3000 Ω linear control (3 kΩ)
	10-201	2	10 kΩ linear control

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous (cont'd.)			
11	40-666	1	Coil
12	45-43	1	RF choke
13	52-126	1	LC filter
14	205-87	1	RF shield
15	206-244	1	Coil shield
16	259-20	1	Solder pin
17	432-121	2	Connector pin
18	434-186	4	Board phono socket
19	438-4	2	Phono plug
	344-15	1	Large black wire
ITEMS FROM PACK #6			
	85-351-2	1	Mixer circuit board
	85-352-2	1	RTTY circuit board

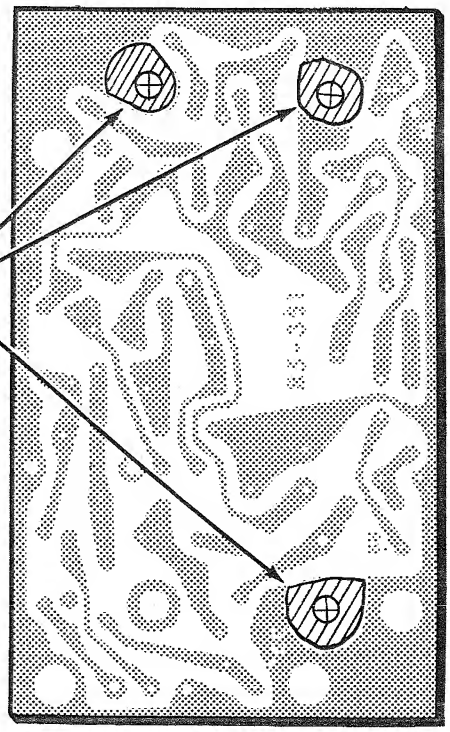
STEP-BY-STEP ASSEMBLY

START

( ) Position the mixer circuit board (#85-351-2) foil side up as shown.

( ) Melt a small amount of solder on the indicated foil areas of the circuit board. Then slowly draw the soldering iron over the indicated foil areas to spread a thin film of solder. This will improve the circuit board ground connection after it is installed in the Receiver.

PROCEED TO PICTORIAL 5-2.



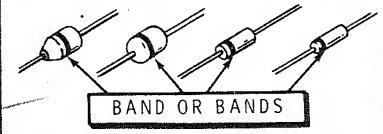
PICTORIAL 5-1

START

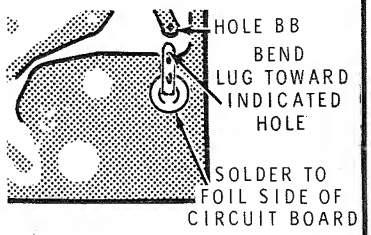
Position the mixer circuit board with the foil side down, as shown in Pictorial 5-2. Then complete each step on Pictorials 5-2 through 5-6.

- ( ) 15 kΩ (brown-green-orange).
- ( ) 150 kΩ (brown-green-yellow).
- ( ) 15 kΩ (brown-green-orange).
- ( ) 47 kΩ (yellow-violet-orange).
- ( ) 100 Ω (brown-black-brown).
- ( ) 220 Ω (red-red-brown).

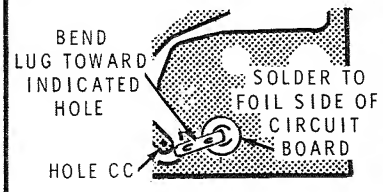
NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.

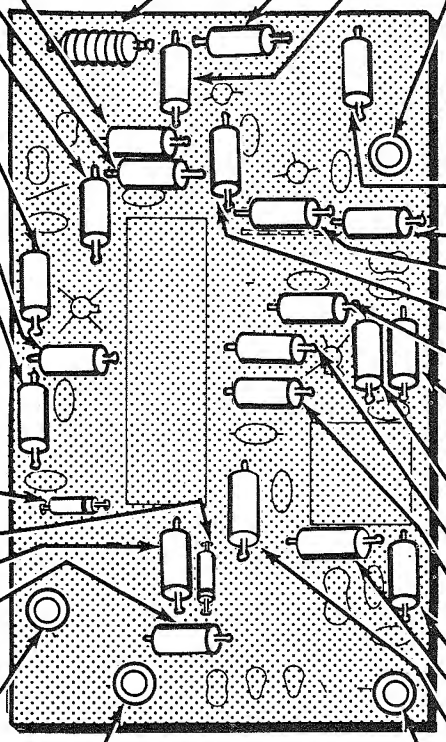


- ( ) 1N4149 diode (#56-56) at D201.
- ( ) 1N4149 diode (#56-56) at D202
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 270 Ω (red-violet-brown).
- ( ) Solder all the leads to the foil and cut off any excess lead lengths.
- ( ) Board phono socket.



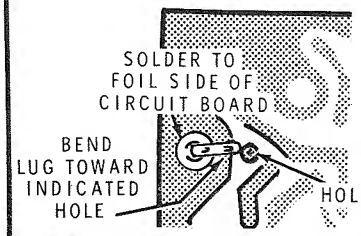
- ( ) Board phono socket.



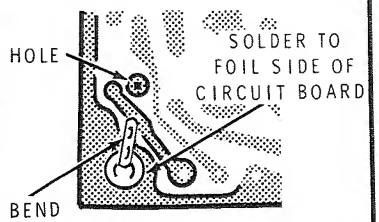


CONTINUE

- ( ) Choke (#45-43).
- ( ) 1000 Ω (brown-black-red).
- ( ) 8200 Ω (gray-red-red).
- ( ) Board phono socket.



- ( ) 8200 Ω (gray-red-red).
- ( ) 1000 Ω (brown-black-red).
- ( ) 8200 Ω (gray-red-red).
- ( ) 8200 Ω (gray-red-red).
- ( ) 8200 Ω (gray-red-red).
- ( ) 47 Ω (yellow-violet-black).
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) 150 kΩ (brown-green-yellow).
- ( ) 47 kΩ (yellow-violet-orange).
- ( ) 100 Ω (brown-black-brown).
- ( ) 47 Ω (yellow-violet-black).
- ( ) 680 Ω (blue-gray-brown).
- ( ) 220 Ω (red-red-brown).
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) Board phono socket.



PICTORIAL 5-2

PROCEED TO PICTORIAL 5-3.

HEATHKIT

START

( ) 10 pF ceramic.

( ) 7.5 pF mica.

( ) 33 pF mica.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

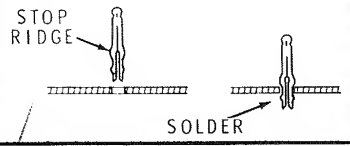
( ) Solder all connections and cut off any excess lead lengths.

( ) .005 µF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) Install a connector pin in circuit board hole "Mute".

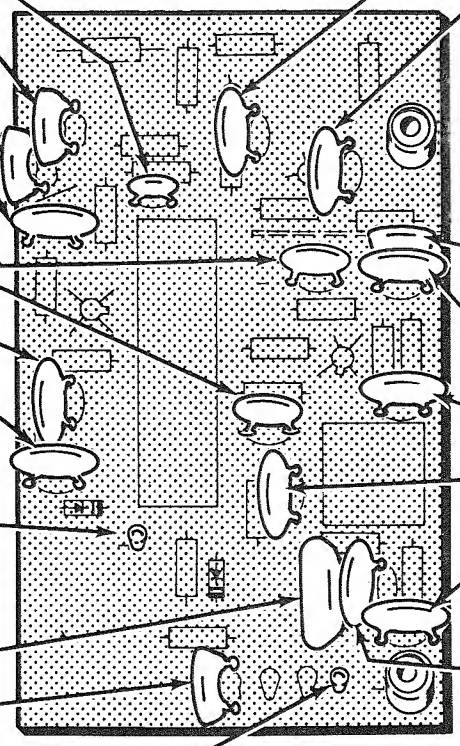


( ) 1000 pF mica.

( ) 470 pF mica.

( ) Install a connector pin in circuit board hole +15.

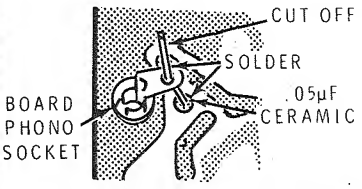
( ) Solder all connections and cut off any excess lead lengths.



CONTINUE

( ) .05 µF ceramic.

( ) .05 µF ceramic. When installing the capacitor, insert the lead nearest the board phono socket through the socket lug. Then solder the lead to the circuit board foil and to the lug. Cut off any excess lead length.



( ) 7.5 pF mica.

( ) .05 µF ceramic.

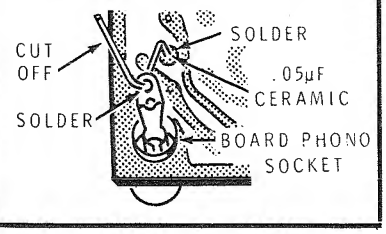
( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) Solder all connections and cut off any excess lead lengths.

( ) .05 µF ceramic. When installing the capacitor, bend the lead nearest the phono socket and insert it through the socket lug. Then solder the lead to the circuit board foil and to the lug. Cut off any excess lead length. NOTE: Do not allow the capacitor lead to touch the foil it crosses over.

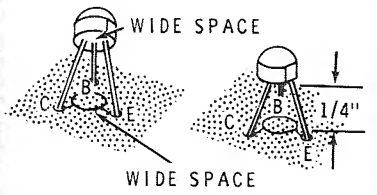


PROCEED TO PICTORIAL 5-4.

PICTORIAL 5-3

START

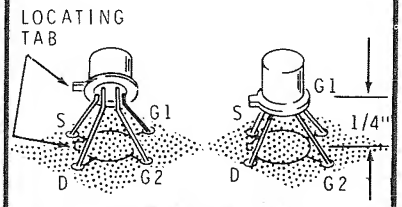
Install the two 2N3694 (#417-171) transistors in the following manner: Locate the wide space between the leads on the transistor. Then insert the transistor leads into their circuit board holes which are indicated by C, B, and E. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.



( ) Transistor 2N3694 (#417-171) at Q201.

( ) Transistor 2N3694 (#417-171) at Q202.

Install the two 40673 (#417-240) transistors in the following manner: Line up the tab of the transistor with the tab outline on the circuit board. Then insert the transistor leads into their circuit board holes which are indicated by S, G1, G2, and D. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.

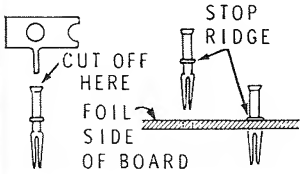


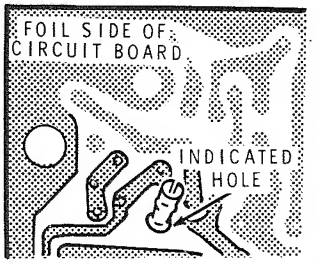
( ) Transistor 40673 (#417-240) at Q203.

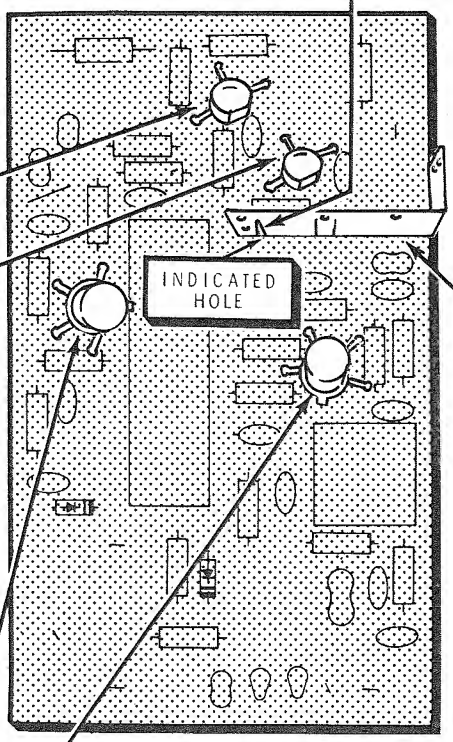
( ) Transistor 40673 (#417-240) at Q204.

CONTINUE

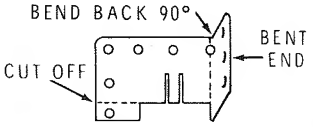
( ) Prepare the solder pin as shown. Then install the solder pin in the indicated circuit board hole on the foil side of the circuit board. Do not solder the pin at this time.







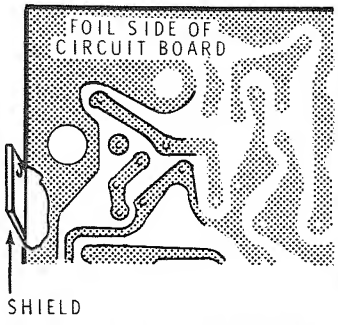
( ) Cut off the indicated portion of the RF shield. Then bend the shield as shown.



( ) Install the prepared shield on the circuit board by inserting the cut off end of the shield into the solder pin slot. It may be necessary to rotate the solder pin to align the slot. Press the bent end of the shield against the edge of the circuit board.

( ) Solder the shield to the solder pin. Do not overheat any components near the shield.

( ) Solder the bent end of the shield to the foil side of the circuit board as shown.



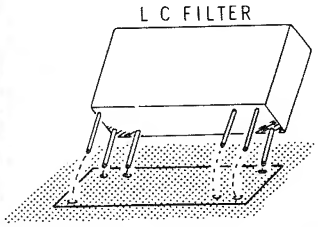
PROCEED TO PICTORIAL 5-5.

PICTORIAL 5-4

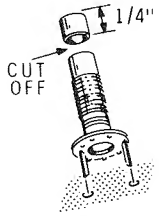
START

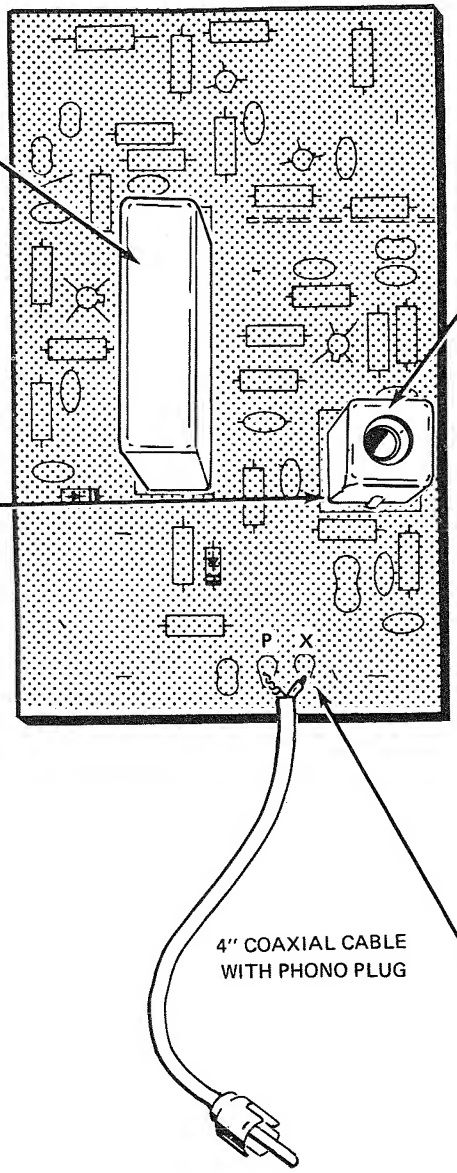
NOTE: Solder all the lugs to the foils as each part is installed.

(✓) LC filter (#52-126). Press it firmly against the circuit board before soldering. NOTE: Disregard any pin numbers on the LC filter.



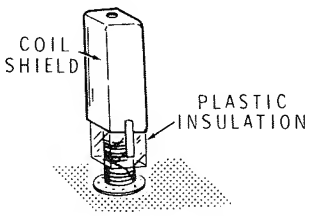
( ) Coil (#40-666). Cut a 1/4" length off the top of the coil form with a pair of side cutters or scissors. Then mount the coil on the circuit board. Press it firmly against the circuit board before soldering.





CONTINUE

( ) Coil shield. Slide a 1/2" length of the internal plastic insulation out of the shield. Then position the coil shield over the coil so the plastic insulation is over the sides of the coil and touching the circuit board. Now carefully push the coil shield down so the coil shield pins go through their corresponding circuit board holes. Press the coil shield firmly against the circuit board before soldering.



(✓) Refer to Pictorial 1-3 (fold-out from Page 4) and prepare a 4" coaxial cable with phono plug. Make sure the shield and inner leads are not shorted by checking them with an ohmmeter.

(✓) Connect the coaxial cable inner lead to circuit board hole X (S-1) and the shield lead to hole P (S-1).

PROCEED TO PICTORIAL 5-6.

PICTORIAL 5-5

START

( ) Refer to Pictorial 1-3 (fold-out from Page 4) and prepare a 5" coaxial cable with phono plug. Make sure the shield and inner leads are not shorted by checking them with an ohmmeter.

NOTE: When connecting wires to the foil side of a circuit board, do not push the insulation tight against the foil. Leave the insulation 1/8" away from the foil to insure a good solder connection between the foil inner lead.

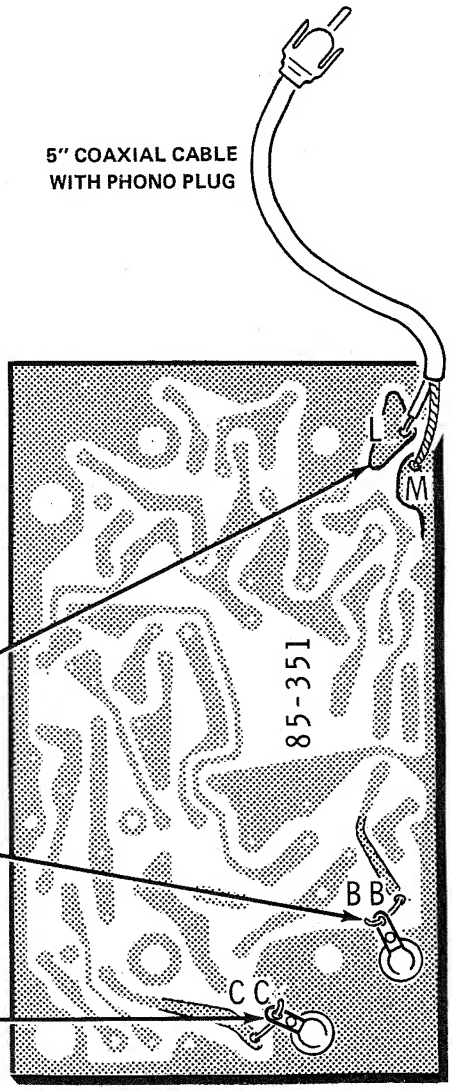
( ) Connect the coaxial cable inner lead to circuit board hole L (S-1) and the shield lead to hole M (S-1). Cut off any excess lead length from the opposite side of the circuit board.

( ) Connect a 3/4" bare wire from circuit board hole BB (S-1) to the indicated phono socket lug (S-1). Cut off any excess lead length from the opposite side of the circuit board.

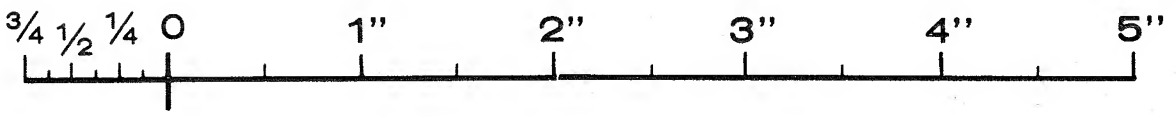
( ) Connect a 3/4" bare wire from circuit board hole CC (S-1) to the indicated phono socket lug (S-1). Cut off any excess lead length from the opposite side of the circuit board.

( ) Check to see that all connections are soldered and cut off the excess lead lengths on both sides of the circuit board. Set the completed circuit board aside until it is needed.

FINISH



PICTORIAL 5-6

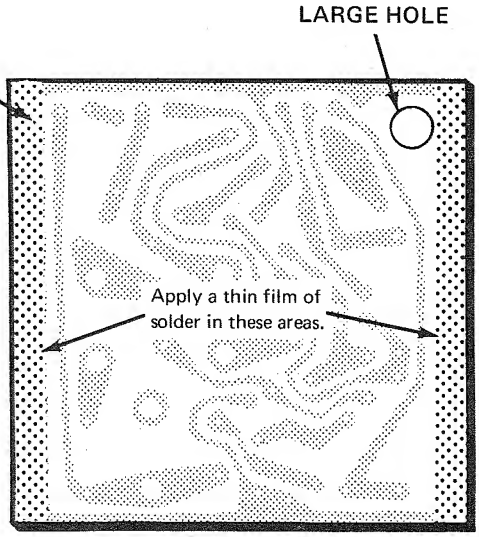


START

( ) Position the RTTY circuit board (#85-352-2) foil side up as shown in Pictorial 6-1.

( ) Apply a thin film of solder to the two indicated foil edges of the circuit board.

PROCEED TO PICTORIAL 7-1



FOIL SIDE UP

PICTORIAL 6-1

START

( ) Position the RTTY circuit board component side up as shown in Pictorial 7-1. Then complete each step on Pictorial 7-1.

(1) 2200 Ω (red-red-red).

(2) 2200 Ω (red-red-red).

(3) 56 kΩ (green-blue-orange).

(4) 2200 Ω (red-red-red).

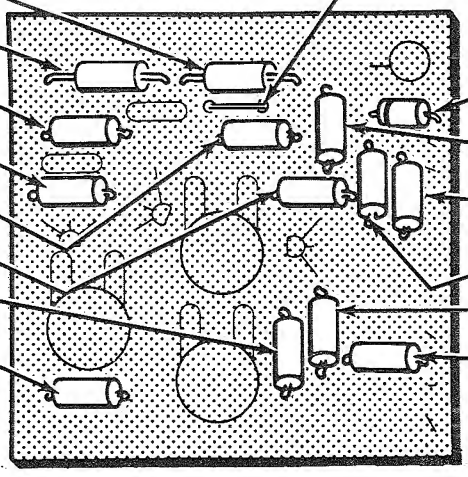
(5) 56 kΩ (green-blue-orange).

(6) 2200 Ω (red-red-red).

(7) 2200 Ω (red-red-red).

(8) 2200 Ω (red-red-red).

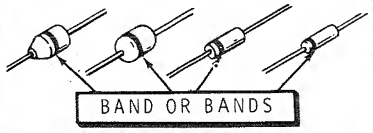
(9) Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

(1) 3/4" bare wire.

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.



(2) Zener diode (#56-67) at ZD301. Position the cathode end as shown.

(3) 1500 Ω (brown-green-red).

(4) 4700 Ω (yellow-violet-red).

(5) 10 kΩ (brown-black-orange).

(6) 2200 Ω (red-red-red).

(7) 4700 Ω (yellow-violet-red).

(8) Solder all leads to the foil and cut off the excess lead lengths.

PROCEED TO PICTORIAL 7-2.

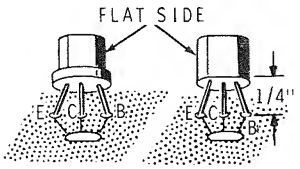
PICTORIAL 7-1

START

( ) .047 µF Mylar.

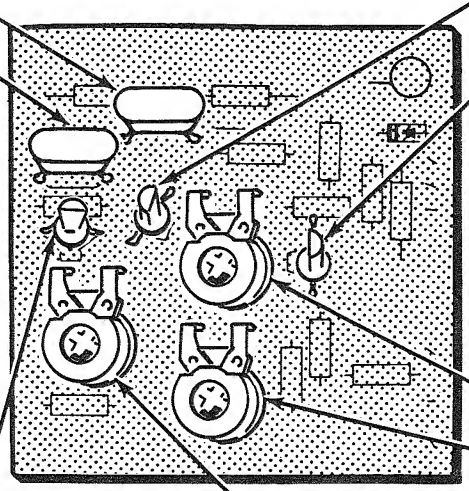
( ) .047 µF Mylar.

Install three 2N3393 (#417-118) transistors in the following manner: Line up the flat side of each transistor with the flat outline on the circuit board. Then insert the transistor leads into their circuit board holes, which are indicated by E, C, and B. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.



( ) Transistor 2N3393 (#417-118) at Q303.

( ) Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) Transistor 2N3393 (#417-118) at Q302.

( ) Transistor 2N3393 (#417-118) at Q301.

Three controls will be installed in the following steps. Install each control as shown.

( ) 10 kΩ linear control (#10-201).

( ) 10 kΩ linear control (#10-201).

( ) 3000 Ω (3 kΩ) linear control (#10-242).

( ) Solder all leads to the foil and cut off the excess lead lengths.

( ) Set the completed circuit board aside until it is needed.

FINISH

PICTORIAL 7-2

IF/AUDIO CIRCUIT BOARD

PARTS LIST

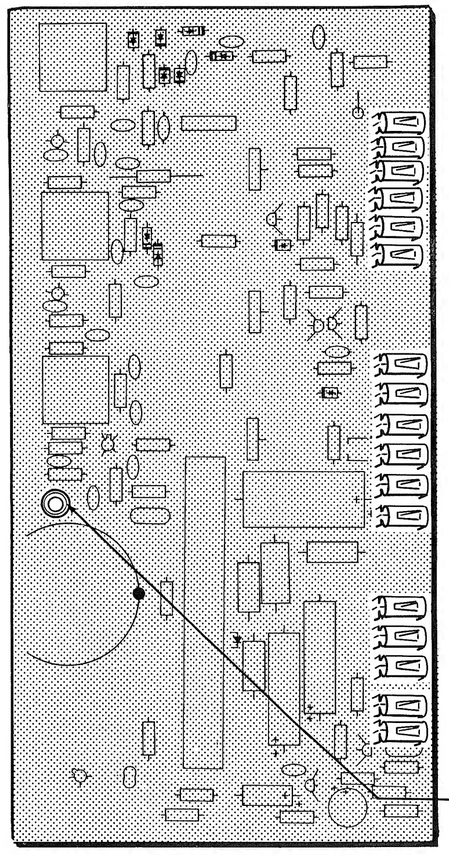
Unpack package #3 and check each part against the following parts list. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 31). This parts package contains all the parts for the IF/AUDIO circuit board, except those required from pack #6.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
	RESISTORS		
	1/2-Watt		
1	1-129	1	4.7 Ω (yellow-violet-gold)
	1-3	7	100 Ω (brown-black-brown)
	1-137	1	200 Ω, 5% (red-black-brown-gold)
	1-42	5	270 Ω (red-violet-brown)
	1-4	5	330 Ω (orange-orange-brown)
	1-6	5	470 Ω (yellow-violet-brown)
	1-9	6	1000 Ω (brown-black-red)
	1-11	1	1500 Ω (brown-green-red)
	1-122	3	3300 Ω, 5% (orange-orange-red-gold)
	1-16	2	4700 Ω (yellow-violet-red)
	1-18	1	5600 Ω (green-blue-red)
	1-73	1	8200 Ω (gray-red-red)
	1-20	2	10 kΩ (brown-black-orange)
	1-21	3	15 kΩ (brown-green-orange)
	1-24	1	33 kΩ (orange-orange-orange)
	1-47	1	56 kΩ (green-blue-orange)
	1-102	1	82 kΩ (gray-red-orange)
	1-36	1	1.5 MΩ (brown-green-green)
	1-40	1	10 MΩ (brown-black-blue)
	Other Resistors		
2	1-18-1	1	150 Ω, 1-watt (brown-green-brown)
	3-6-2	2	.51 Ω, 2-watt, 5% (green-brown-silver-gold)
3	1-20-2	1	100 Ω, 2-watt (brown-black-brown)
	CONTROLS		
4	10-294	2	2000 Ω (2 kΩ)
	10-295	1	750 Ω
	CAPACITORS		
	Ceramic		
5	21-78	2	5 pF
6	21-25	1	1300 pF (.0013 μF)
	21-143	17	.05 μF

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Electrolytic			
7	25-123	1	2 μF
	25-125	1	5 μF
8	25-116	1	50 μF
9	25-146	2	100 μF
10	25-199	1	500 μF
Other Capacitors			
11	20-114	1	270 pF mica
12	27-47	2	.1 μF Mylar
COIL-TRANSFORMERS-DIODES			
13	40-581	1	620 μH fixed inductor (blue-red-brown)
14	52-125	3	3.395 MHz IF transformer
15	56-26-1	4	1N191 diode (brown-white-brown)
	56-56	6	1N4149 diode
	56-61	1	Stabistor diode
16	56-33	1	1N3754 diode
TRANSISTORS			
17	417-100	1	2N3053
18	417-118	5	2N3393
19	417-171	2	2N3694
20	417-240	1	40673
	117-9	1	Transistor package
Consisting of:			
21	417-144	1	MJE521
	417-145	1	MJE371
22	254-22	2	Torque washer

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
HEAT SINKS-HARDWARE			
23	215-19	1	Clamp heat sink
24	215-31	1	TO 5 heat sink
25	215-39	1	Audio heat sink
26	250-273	2	4-40 x 3/8" screw
27	250-285	7	4-40 x 1/4" screw
28	252-15	9	4-40 nut
29	254-9	9	#4 lockwasher
MISCELLANEOUS			
30	63-566	1	Switch wafer (yellow dot)
31	75-102	2	Insulator (packed between two pieces of cardboard)
32	352-13	1	Silicone grease
33	432-124	17	Circuit board connector
34	434-186	1	Board phono socket
35	438-4	1	Phono plug
36	490-5	1	Nut starter
ITEMS FROM PACK #6			
37	204-1046	1	Support rail
	85-353-3	1	IF/audio circuit board

STEP-BY-STEP ASSEMBLY

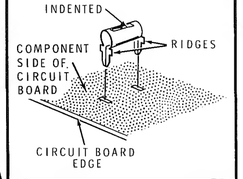


PICTORIAL 8-1

START

( ) Position the IF/AUDIO circuit board (#85-353-3) as shown. Then complete each step in the Pictorial.

NOTE: Install the circuit board connectors in the following manner. Note that on one end of the connector, the spring contacts are indented. This end of the connector should face away from the edge of the circuit board. Insert the mounting tabs through the circuit board until the ridges of the connector are firmly against the circuit board. Solder the tabs to the foil.

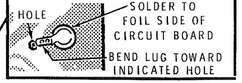


( ) 6 circuit board connectors.

( ) 6 circuit board connectors.

( ) 5 circuit board connectors.

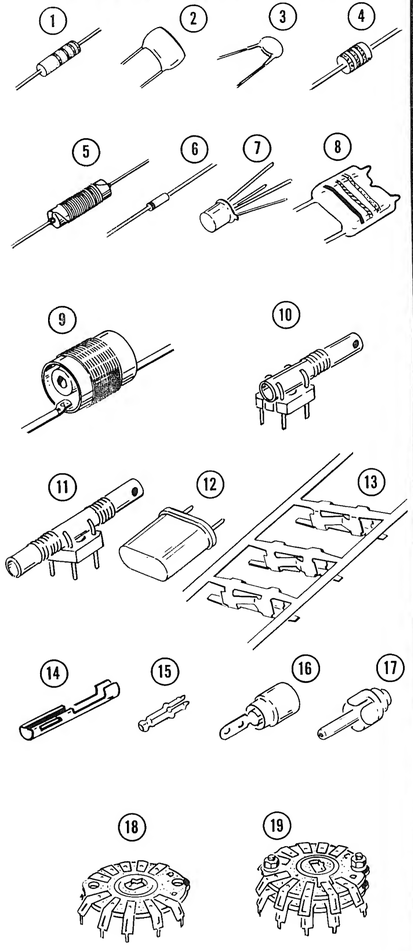
( ) Board phono socket.



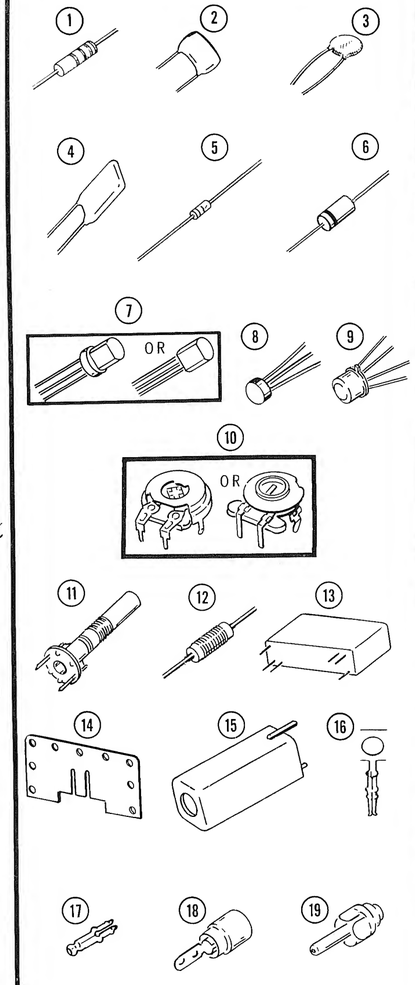
PROCEED TO PICTORIAL 8-2.

PARTS PICTORIALS

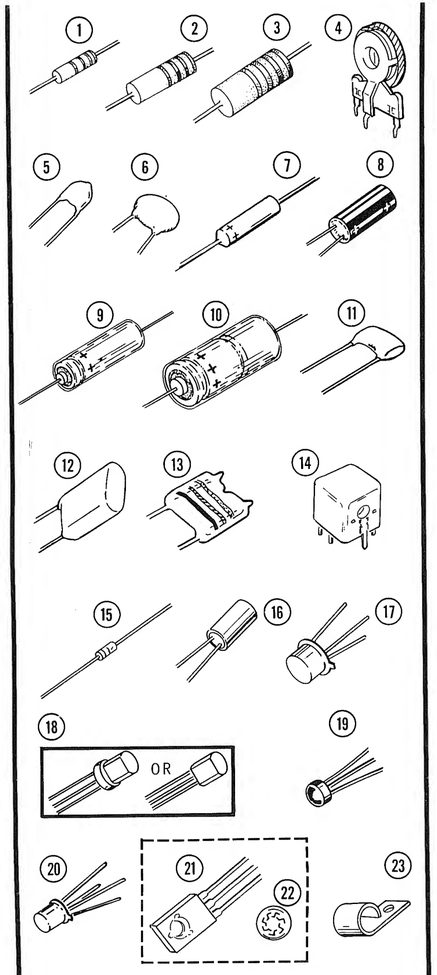
Antenna, RF Amplifier, Heterodyne Oscillator, and Crystal Switch-Boards

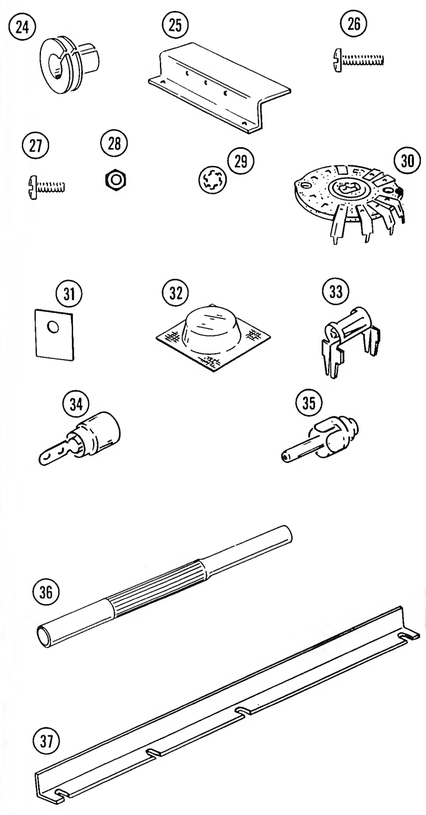


Mixer and RTTY Circuit Boards



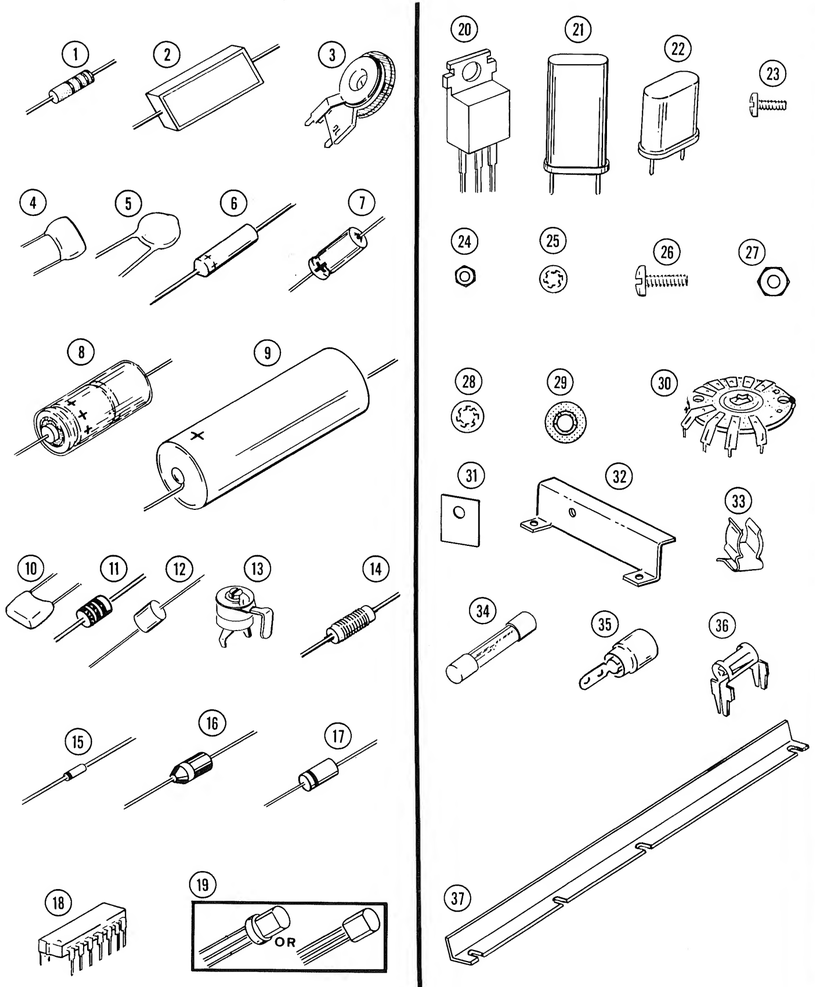
IF/Audio Circuit Board



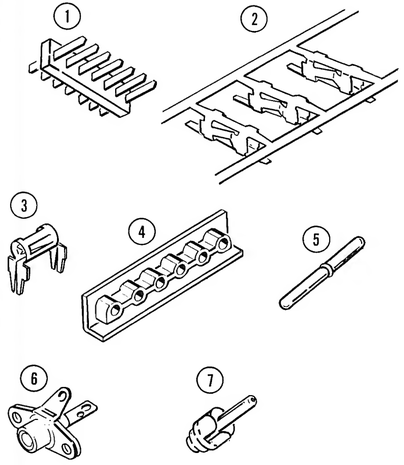


PARTS PICTORIALS

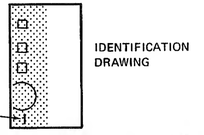
Power Supply/BFO Circuit Board



Plug Board, and Extender Accessories



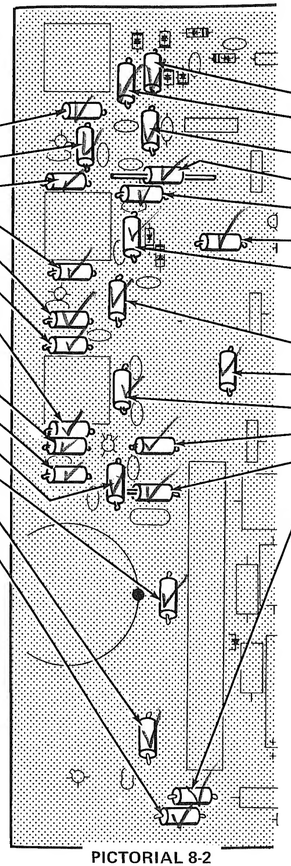
HEATHKIT



START

NOTE: Only part of the circuit board is shown in some of the following Pictorials. An identification drawing at the top of the Pictorial shows the area of the circuit board to be assembled.

- 330 Ω (orange-orange-brown).
- 470 Ω (yellow-violet-brown).
- 3300 Ω, 5% (orange-orange-red-gold).
- 330 Ω (orange-orange-brown).
- 470 Ω (yellow-violet-brown).
- 3300 Ω 5% (orange-orange-red-gold).
- 330 Ω (orange-orange-brown).
- Solder all connections and cut off any excess lead lengths.
- 270 Ω (red-violet-brown).
- 1000 Ω (brown-black-red).
- 1000 Ω (brown-black-red).
- 4.7 Ω (yellow-violet-gold).
- 3300 Ω, 5% (orange-orange-red-gold).
- 200 Ω, 5% (red-black-brown-gold).
- Solder all connections and cut off any excess lead lengths.

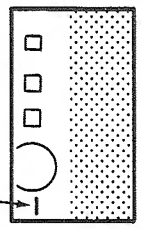


CONTINUE

- 100 Ω (brown-black-brown).
- 100 Ω (brown-black-brown).
- 100 Ω (brown-black-brown).
- 1000 Ω (brown-black-red).
- 15 kΩ (brown-green-orange).
- 470 Ω (yellow-violet-brown).
- 100 Ω (brown-black-brown).
- Solder all connections and cut off any excess lead lengths.
- 15 kΩ (brown-green-orange).
- 8200 Ω (gray-red-red).
- 100 Ω (brown-black-brown).
- 1000 Ω (brown-black-red).
- 82 kΩ (gray-red-orange).
- 470 Ω (yellow-violet-brown).
- Solder all connections to the foil and cut off any excess lead lengths.

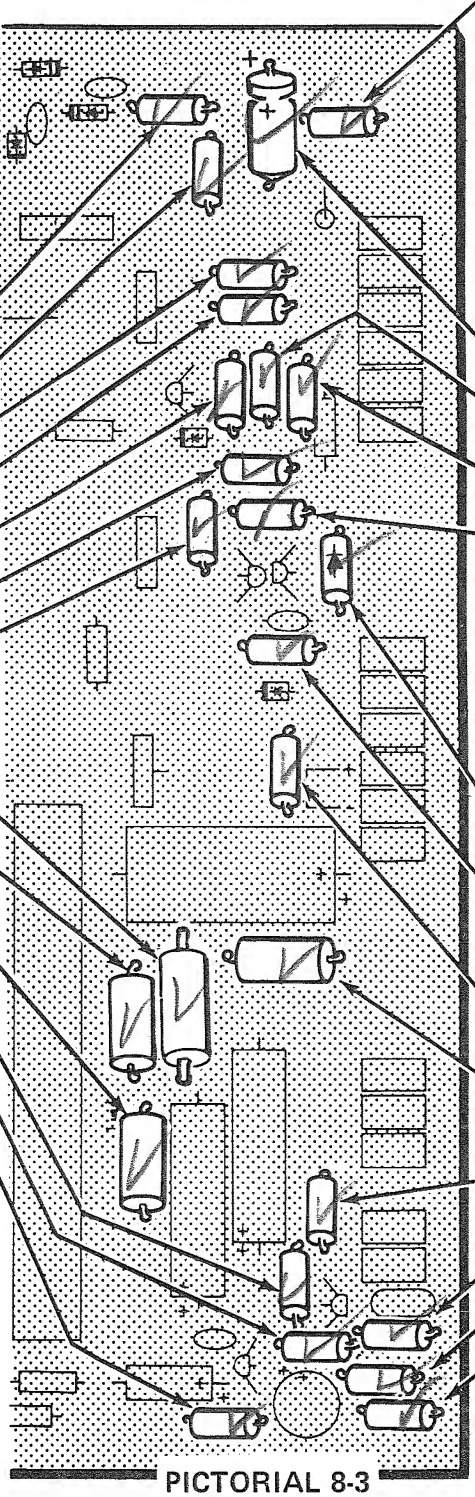
PROCEED TO PICTORIAL 8-3.

PICTORIAL 8-2



START

- ( ) 10 MΩ (brown-black-blue).
- ( ) 33 kΩ (orange-orange-orange).
- ( ) 1.5 MΩ (brown-green-green).
- ( ) 1500 Ω (brown-green-red).
- ( ) 15 kΩ (brown-green-orange).
- ( ) 270 Ω (red-violet-brown).
- ( ) 270 Ω (red-violet-brown).
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) 100 Ω (brown-black-brown), 2-watt.
- ( ) .51 Ω, 5% (green-brown-silver), 2-watt.
- ( ) .51 Ω, 5% (green-brown-silver), 2-watt.
- ( ) 5600 Ω (green-blue-red).
- ( ) 56 kΩ (green-blue-orange).
- ( ) 1000 Ω (brown-black-red).
- ( ) Solder all connections and cut off any excess lead lengths.

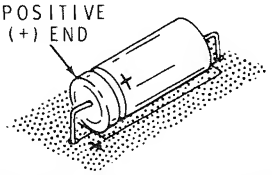


PICTORIAL 8-3

CONTINUE

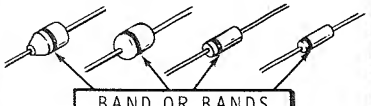
- ( ) 10 kΩ (brown-black-orange).

NOTE: When you install an electrolytic capacitor be sure to match the positive (+) marked end of the capacitor with the positive (+) mark on the circuit board.



- ( ) 5 μF electrolytic. If necessary, bend the capacitor leads under the body of the capacitor so the leads fit into the holes properly.
- ( ) 10 kΩ (brown-black-orange).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 270 Ω (red-violet-brown).

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.



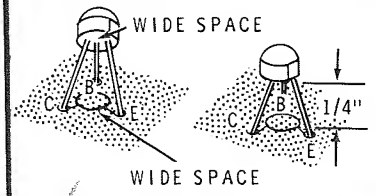
- ( ) Stabistor diode (#56-61) at D513.
- ( ) 1000 Ω (brown-black-red).
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) 470 Ω (yellow-violet-brown).
- ( ) 150 Ω (brown-green-brown) 1 watt.
- ( ) 100 Ω (brown-black-brown).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 330 Ω (orange-orange-brown).
- ( ) 100 Ω (brown-black-brown).
- ( ) Solder all connections and cut off any excess lead lengths.

PROCEED TO PICTORIAL 8-4.

HEATHKIT

START

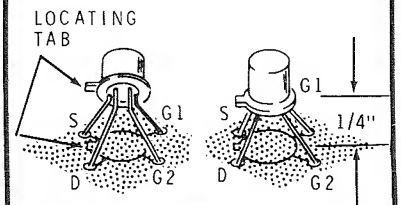
Install the two 2N3694 (#417-171) transistors in the following manner: Locate the wide space between the leads in the transistor. Then insert the transistor leads into their circuit board holes which are indicated by C, B, and E. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.



( ) 2N3694 transistor (#417-171) at Q503.

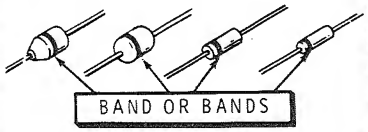
( ) 2N3694 transistor (#417-171) at Q502.

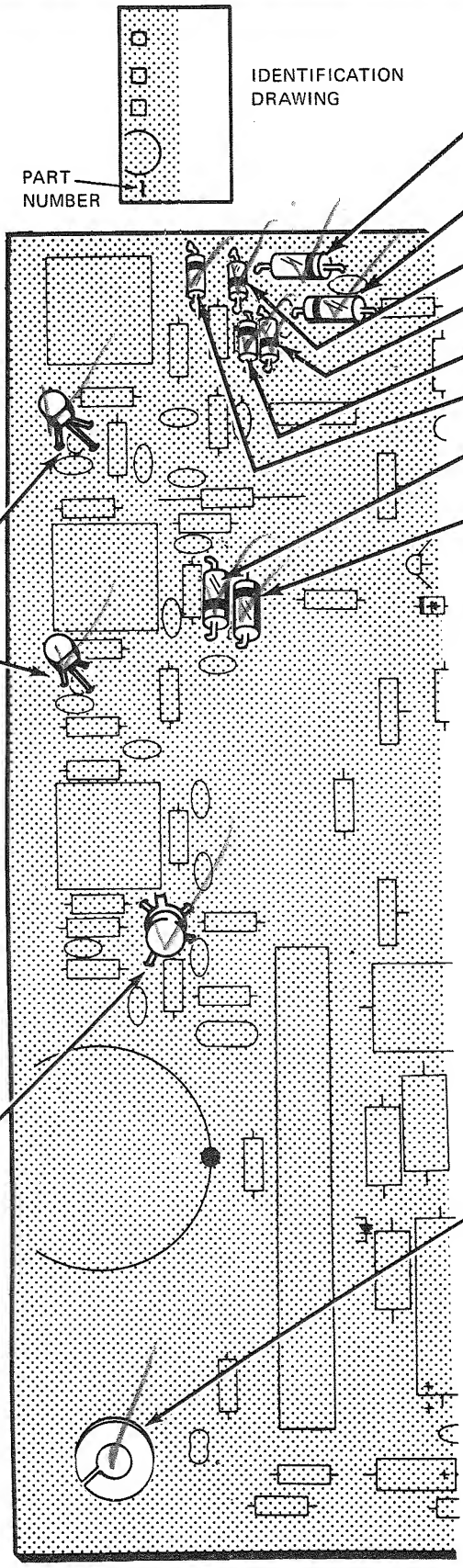
NOTE: Install the following transistor as shown by lining up the tab on the transistor with the outline of the tab on the circuit board. Then insert the leads into their correct holes, which are indicated by S, G1, G2, and D. Solder the leads to the foil and cut off the excess lead lengths.



( ) 40673 transistor (#417-240) at Q501.

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.





CONTINUE

( ) 1N191 diode (#56-26-1) brown-white-brown at D508.

( ) 1N191 diode (#56-26-1) brown-white-brown at D507.

( ) 1N4149 diode (#56-56) at D504.

( ) 1N4149 diode (#56-56) at D503.

( ) 1N4149 diode (#56-56) at D502.

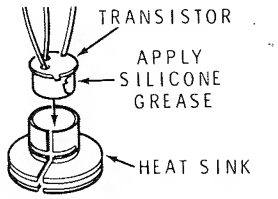
( ) 1N4149 diode (#56-56) at D501.

( ) 1N191 diode (#56-26-1) brown-white-brown at D506.

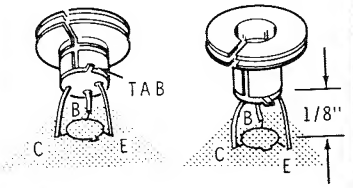
( ) 1N191 diode (#56-26-1) brown-white-brown at D505.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) Apply a film of silicone grease around the side of the 36632 transistor (#417-100). Then place the TO 5 heat sink on your work area as shown, and press the transistor into it.

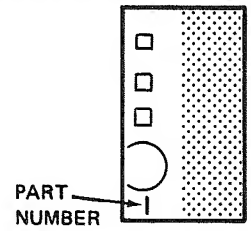


( ) 2N3053 transistor (#417-100). Line up the locating tab on the transistor with the outline of the locating tab on the circuit board. Then insert the transistor leads into their correct holes, which are indicated by C, B, and E at Q509. Solder each lead to the foil and cut off the excess lead lengths.



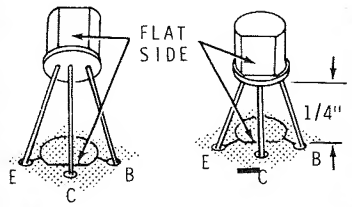
PROCEED TO PICTORIAL 8-5.

PICTORIAL 8-4



START

NOTE: Install the following transistors by lining up the flat on each transistor with the outline of the flat on the circuit board. Then insert the leads into their correct holes, which are indicated by E, C, and B. Solder the leads to the foil and cut off the excess lead lengths.



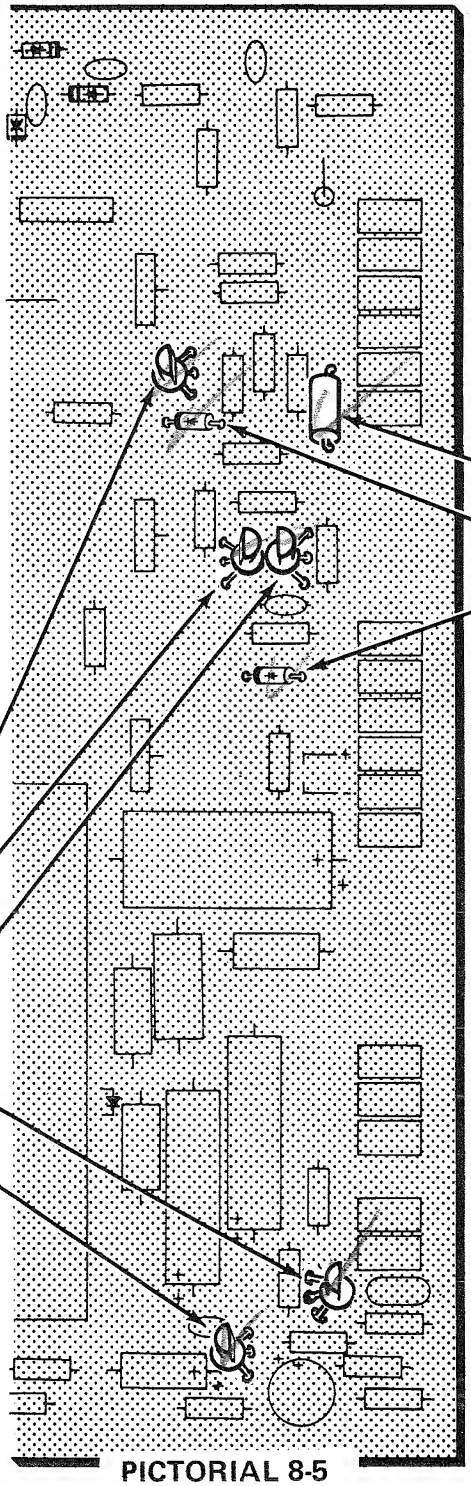
( ) 2N3393 transistor (#417-118) at Q504.

( ) 2N3393 transistor (#417-118) at Q506.

( ) 2N3393 transistor (#417-118) at Q505.

( ) 2N3393 transistor (#417-118) at Q507.

( ) 2N3393 transistor (#417-118) at Q508.



PICTORIAL 8-5

CONTINUE

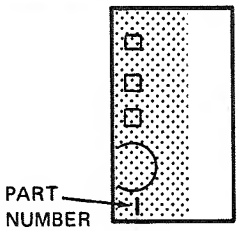
( ) 270 Ω (red-violet-brown).

( ) 1N4149 diode (#56-56) at D512.

( ) 1N4149 diode (#56-56) at D509.

( ) Solder all connections and cut off any excess lead lengths.

PROCEED TO PICTORIAL 8-6.



IDENTIFICATION DRAWING

START

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

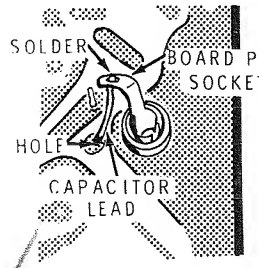
( ) .05 µF ceramic.

( ) .05 µF ceramic.

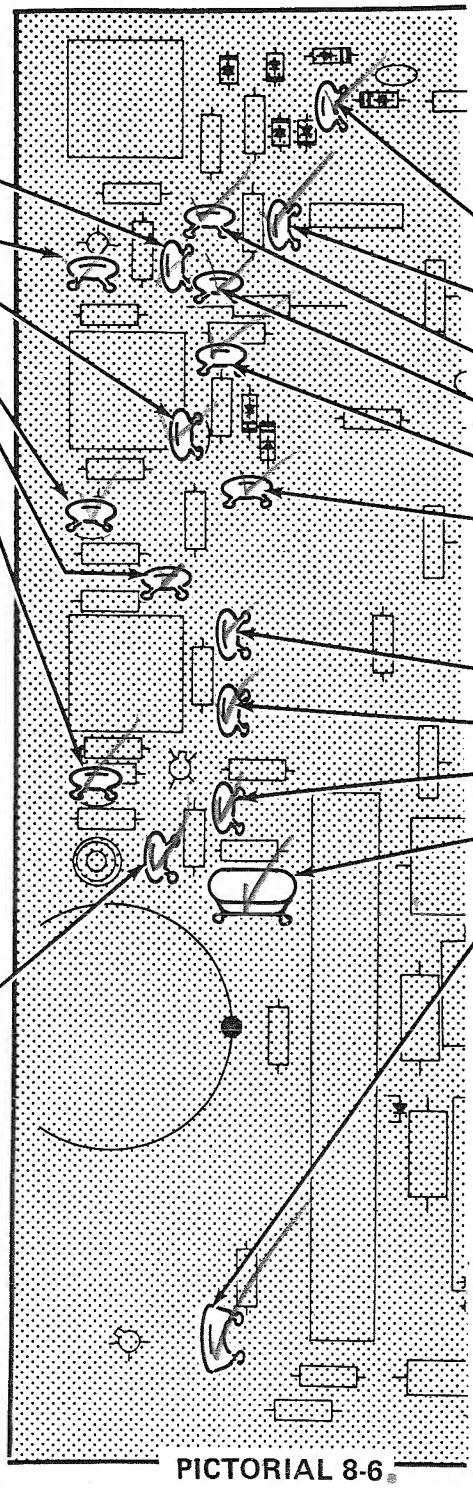
( ) .05 µF ceramic.

( ) Solder all connections and cut off any excess lead lengths.

NOTE: When you install the following .05 µF ceramic capacitor, insert the capacitor lead from the indicated hole through the board phono socket lug and solder. Solder the other lead to the foil and cut off the excess lead lengths.



( ) .05 µF ceramic.



CONTINUE

( ) 5 pF ceramic.

( ) 5 pF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) Solder all connections and cut off any excess lead lengths.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

( ) .05 µF ceramic.

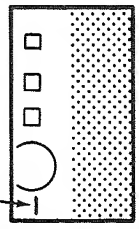
( ) .1 µF Mylar.

( ) 270 pF mica.

( ) Solder all connections and cut off any excess lead lengths.

PROCEED TO PICTORIAL 8-7.

PICTORIAL 8-6



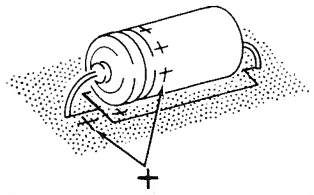
IDENTIFICATION DRAWING

START

( ) .05 µF ceramic.

( ) .05 µF ceramic.

NOTE: When you install an electrolytic capacitor be sure to match the positive (+) marked end of the capacitor with the positive (+) mark on the circuit board.



( ) 500 µF electrolytic.

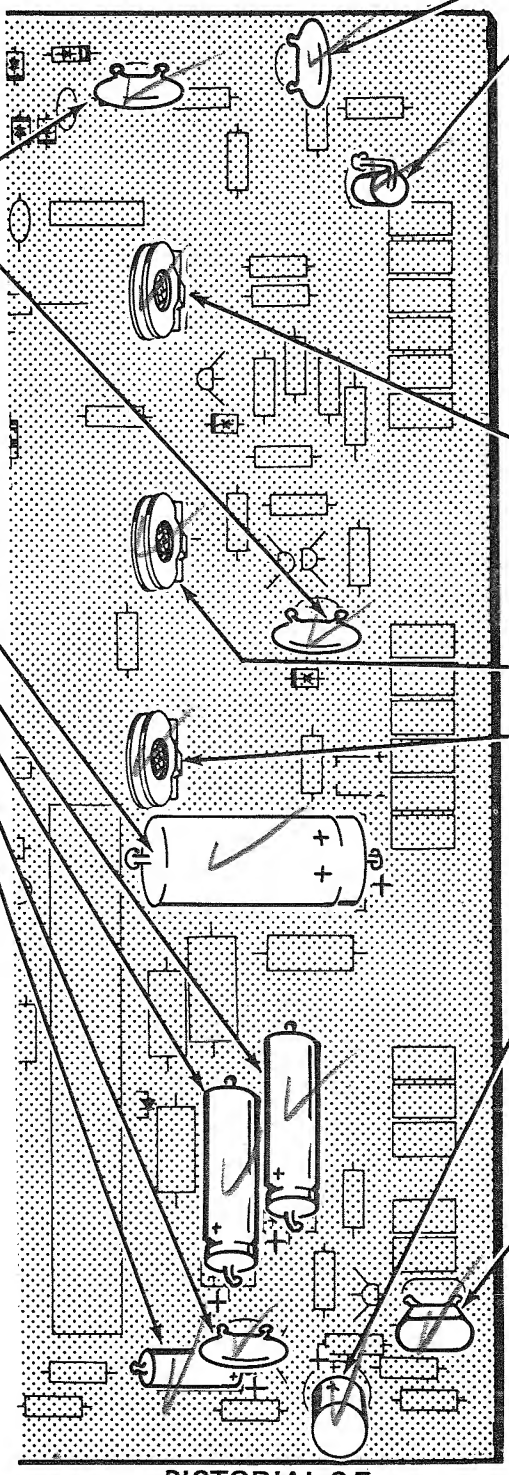
( ) 100 µF electrolytic.

( ) 100 µF electrolytic.

( ) 1300 pF ceramic (.0013 µF).

( ) 2 µF electrolytic.

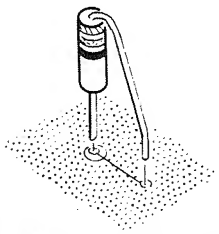
( ) Solder all connections and cut off any excess lead lengths.



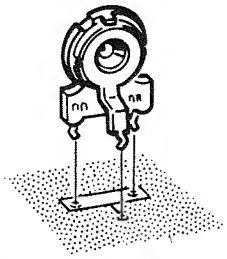
CONTINUE

( ) .05 µF ceramic.

( ) 330 Ω (orange-orange-brown).



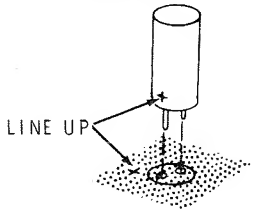
( ) 2000 Ω (2 k) control (#10-294). Solder the lugs to the foil.



( ) 2000 Ω (2 k) control (#10-294). Solder the lugs to the foil.

( ) 750 Ω control (#10-295). Solder the lugs to the foil.

( ) 50 µF electrolytic. Be sure to match the positive (+) marking on the capacitor with the positive (+) mark on the circuit board.



( ) .1 µF Mylar.

( ) Solder all connections and cut off any excess lead lengths.

PROCEED TO PICTORIAL 8-8.

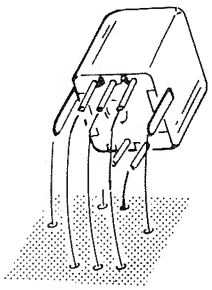
PICTORIAL 8-7

START

Solder the lugs of the following parts to the foil as they are installed.

( ) 620 μH fixed inductor (#40-581) blue-red-brown.

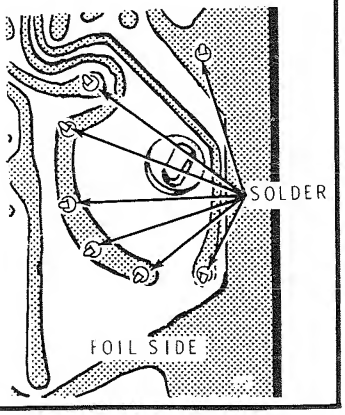
( ) 3.395 MHz IF transformer (#52-125). Seat the transformer firmly against the circuit board before soldering.

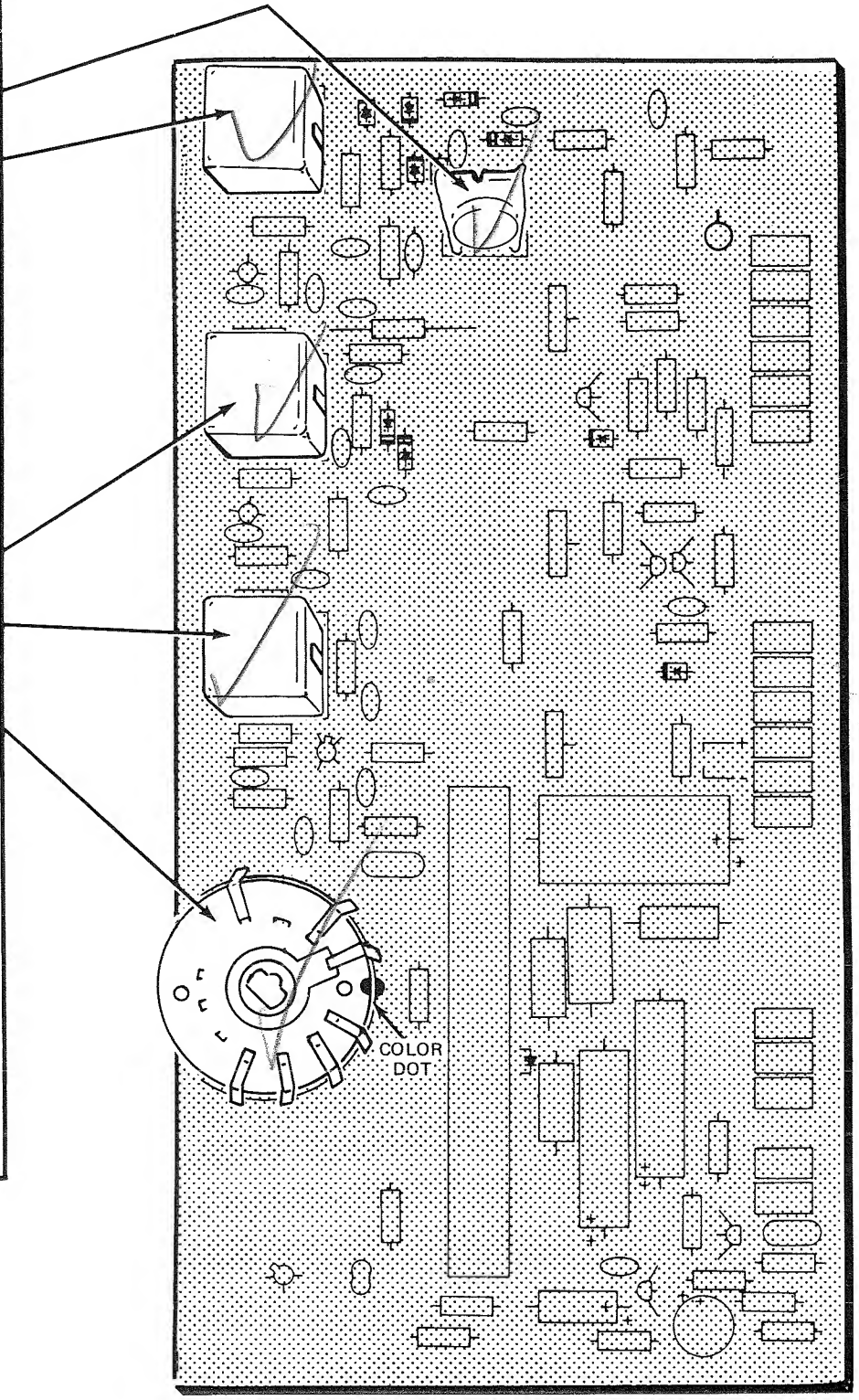


( ) 3.395 MHz IF transformer (#52-125).

( ) 3.395 MHz IF transformer (#52-125).

( ) Mount the switch wafer (yellow dot) on the circuit board, making sure the color dots line up. Be sure to carefully insert the pins into their proper holes.





PICTORIAL 8-8

HEAT-SINK ASSEMBLY

NOTE: Use the nut starter to pick up and start 6-32 and 4-40 nuts on screws.

Refer to Detail 8-9A for the following steps.

( ) Locate the transistor package (#117-9), the audio heat sink, two insulators (packed between two pieces of cardboard), and the silicone grease.

( ) Apply a liberal amount of silicone grease to both sides of each insulator. Then position the insulators on the audio heat sink.

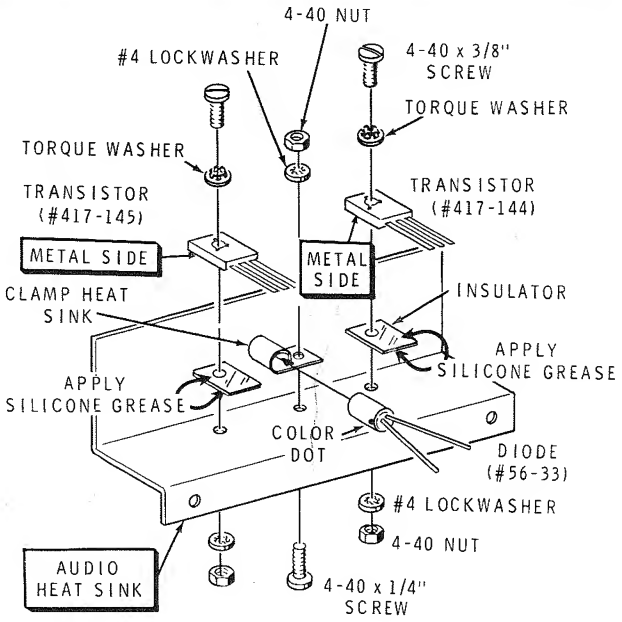
NOTE: In the next step, be sure to mount the metal side of the transistor toward the heat sink.

( ) Mount an MJE371 transistor (#417-145) on the insulator and audio heat sink with a 4-40 x 3/8" screw, a torque washer (supplied with the transistor), a #4 lockwasher, and a 4-40 nut. Do not overtighten the hardware on the transistor, as the transistor may be damaged.

( ) Mount an MJE521 transistor (#417-144) on the insulator and audio heat sink with a 4-40 x 3/8" screw, a torque washer (supplied with the transistor), a #4 lockwasher, and a 4-40 nut. Do not overtighten the hardware on the transistor, as the transistor may be damaged.

( ) Apply a liberal amount of silicone grease to the 1N3754 diode (#56-33). Then insert the diode into the clamp heat sink. Be sure the color dot is positioned as shown. Save the remaining grease for later use.

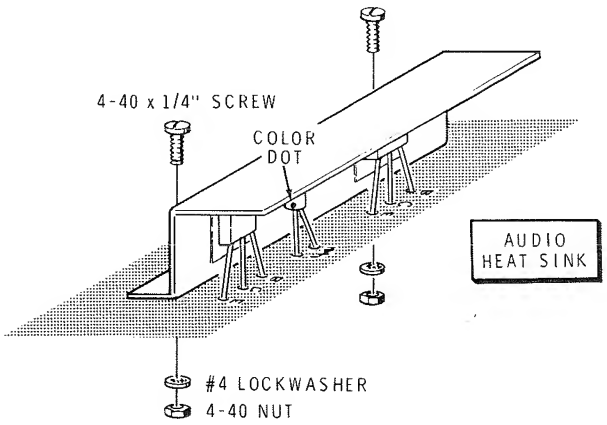
( ) Mount the clamp heat sink to the audio heat sink with a 4-40 x 1/4" screw, a #4 lockwasher, and a 4-40 nut.



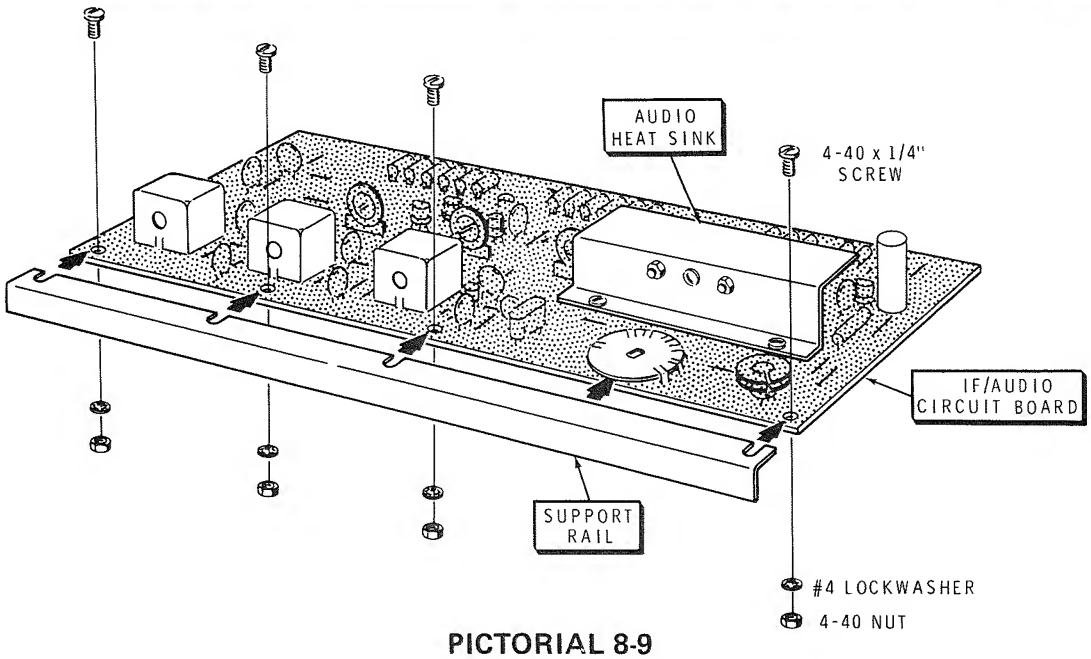
Detail 8-9A

( ) Refer to Detail 8-9B and slightly spread the transistor leads with your finger. Then mount the audio heat sink to the circuit board with two 4-40 x 1/4" screws, two #4 lockwashers, and two 4-40 nuts. Be sure the transistor leads and diode leads are inserted into their correct holes.

( ) Solder the leads of both transistors and the diode to the foil and cut off the excess lead lengths.



Detail 8-9B



PICTORIAL 8-9

( ) Refer to Pictorial 8-9 and mount the support rail to the circuit board with four 4-40 x 1/4" screws, four #4 lockwashers, and four 4-40 nuts.

( ) Refer to Pictorial 1-3 (fold-out from Page 4) and prepare each end of a 12-1/2" coaxial cable, and connect a phono plug to one end as shown.

Refer to Pictorial 8-10 for the following steps.

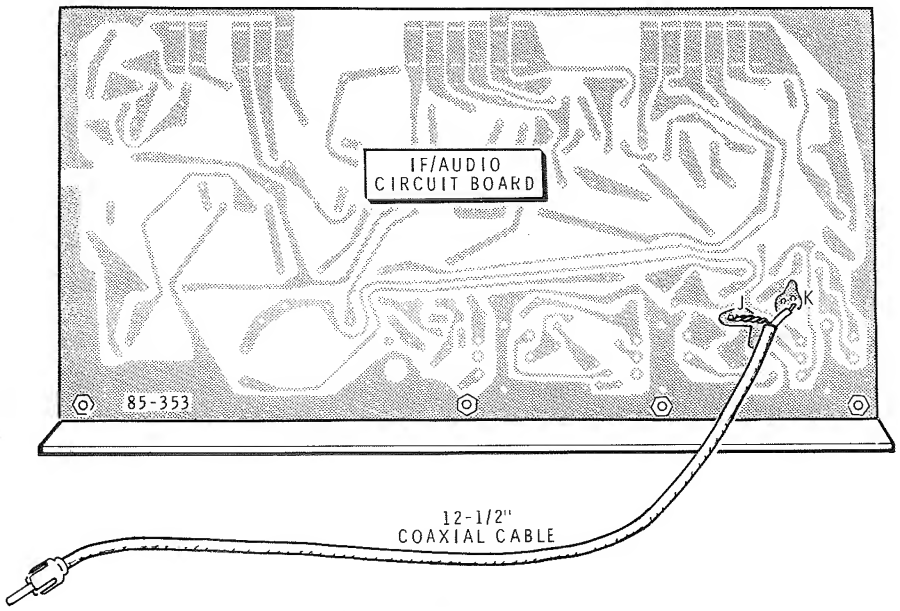
( ) Position the IF/audio circuit board foil side up as shown.

( ) Connect the inner coaxial cable lead to hole K on the foil side of the circuit board. Position the insulation 1/8" away from the foil to ensure a good solder connection between the foil and the wire (S-1).

( ) Insert 1/8" of the shield lead into hole J (S-1).

( ) Clip off the excess lead lengths on the component side of the board.

( ) Set the completed circuit board aside until it is called for.



PICTORIAL 8-10

POWER SUPPLY/BFO CIRCUIT BOARD

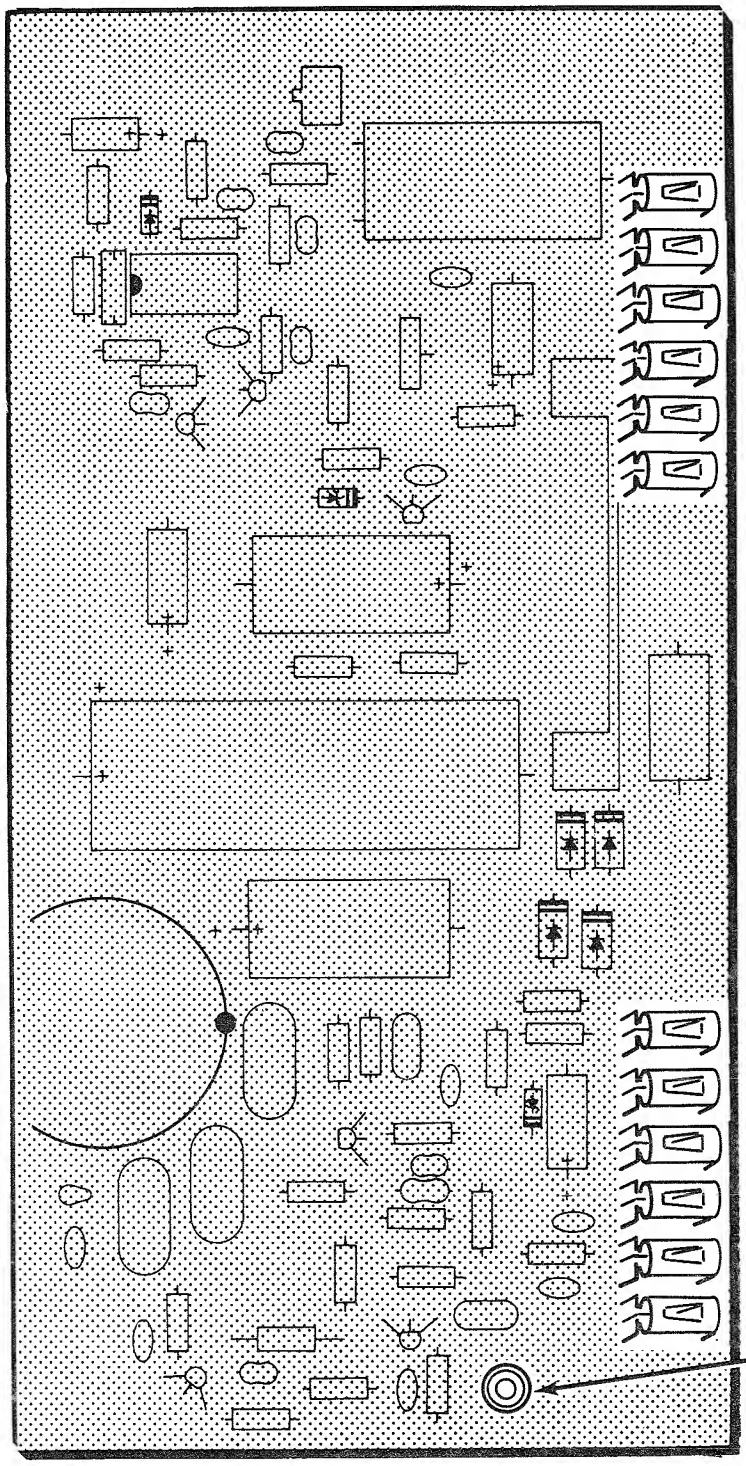
PARTS LIST

Unpack package #4 and check each part against the following parts list. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 32). This parts package contains all the parts for the power supply/BFO circuit board, except those required from pack #6.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS			
1/2-Watt			
1	1-54	1	15 Ω, 5% (brown-green-black-gold)
	1-1	3	47 Ω (yellow-violet-black)
	1-3	1	100 Ω (brown-black-brown)
	1-66	2	150 Ω (brown-green-brown)
	1-45	2	220 Ω (red-red-brown)
	1-6	2	470 Ω (yellow-violet-brown)
	1-79	1	820 Ω, 5% (gray-red-brown-gold)
	1-9	3	1000 Ω (brown-black-red)
	1-44	1	2200 Ω (red-red-red)
	1-14	1	3300 Ω (orange-orange-red)
	1-16	5	4700 Ω (yellow-violet-red)
	1-20	1	10 kΩ (brown-black-orange)
	1-21	1	15 kΩ (brown-green-orange)
	1-58	2	22 kΩ, 5% (red-red-orange-gold)
	1-25	1	47 kΩ (yellow-violet-orange)
	1-26	3	100 kΩ (brown-black-yellow)
Other Resistors			
2	3-17-5	1	50 Ω, 5-watt resistor
3	10-294	1	2000 Ω (2 k) linear control
CAPACITORS			
Mica			
4	20-118	1	15 pF
	20-99	1	22 pF
	20-109	3	62 pF
	20-139	1	330 pF
	20-107	1	680 pF
Ceramic			
5	21-157	1	5 pF
	21-51	1	20 pF
	21-163	1	.001 µF
	21-143	8	.05 µF

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Electrolytic			
6	25-123	3	2 μF
7	25-54	1	10 μF
8	25-199	2	500 μF
9	25-192	1	2000 μF
Other Capacitors			
10	27-47	2	.1 μF Mylar
11	28-1	2	2.2 pF phenolic (red-red-white)
12	29-4	1	1800 pF polystyrene
13	31-57	1	2.7-20 pF ceramic trimmer
RF CHOKE-DIODES-INTEGRATED CIRCUIT			
14	45-39	1	RF choke
15	56-56	1	1N4149 diode
16	57-27	4	1N2071 diode
17	56-67	2	Zener diode
18	443-8	1	MC724P integrated circuit
TRANSISTORS			
19	417-91	3	2N5232A
	417-85	3	E844
20	417-175	1	2N5294
CRYSTALS			
21	404-43	1	100 kHz
22	404-280	1	3392.110 kHz
	404-205	1	3393.6 kHz
	404-206	1	3396.4 kHz
HARDWARE			
23	250-285	6	4-40 x 1/4" screw
24	252-15	6	4-40 nut
25	254-9	6	#4 lockwasher
26	250-89	1	6-32 x 3/8" screw
27	252-3	1	6-32 nut
28	254-1	1	#6 lockwasher
29	253-2	1	#6 fiber shoulder washer
MISCELLANEOUS			
30	63-567	1	Switch wafer (blue-dot)
31	75-102	1	Insulator (packed between two pieces of cardboard)
32	215-40	1	Heat sink
33	260-56	2	Fuse clip
34	421-13	1	1/2-ampere fuse
35	434-186	3	Board phono socket
36	432-124	12	Circuit board connector
ITEMS FROM PACK #6			
37	204-1046	1	Support rail
	85-354-3	1	Power supply/BFO circuit board

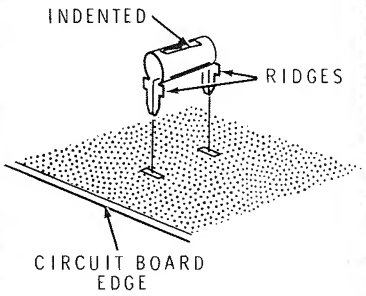
STEP-BY-STEP ASSEMBLY



START

( ) Position the power supply/BFO circuit board (#85-354-3) as shown. Then complete each step in the Pictorial.

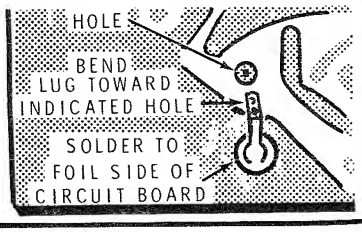
NOTE: Install the circuit board connectors in the following manner. Note that on one end of the connector, the spring contacts are indented. This end of the connector should fit away from the edge of the circuit board. Insert the mounting tabs through the circuit board until the ridges of the connector are firmly against the circuit board. Solder the tabs to the foil.



( ) 6 circuit board connectors.

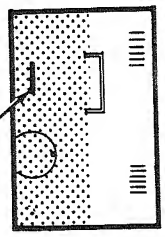
( ) 6 circuit board connectors.

( ) Board phono socket.



PROCEED TO PICTORIAL 9-2

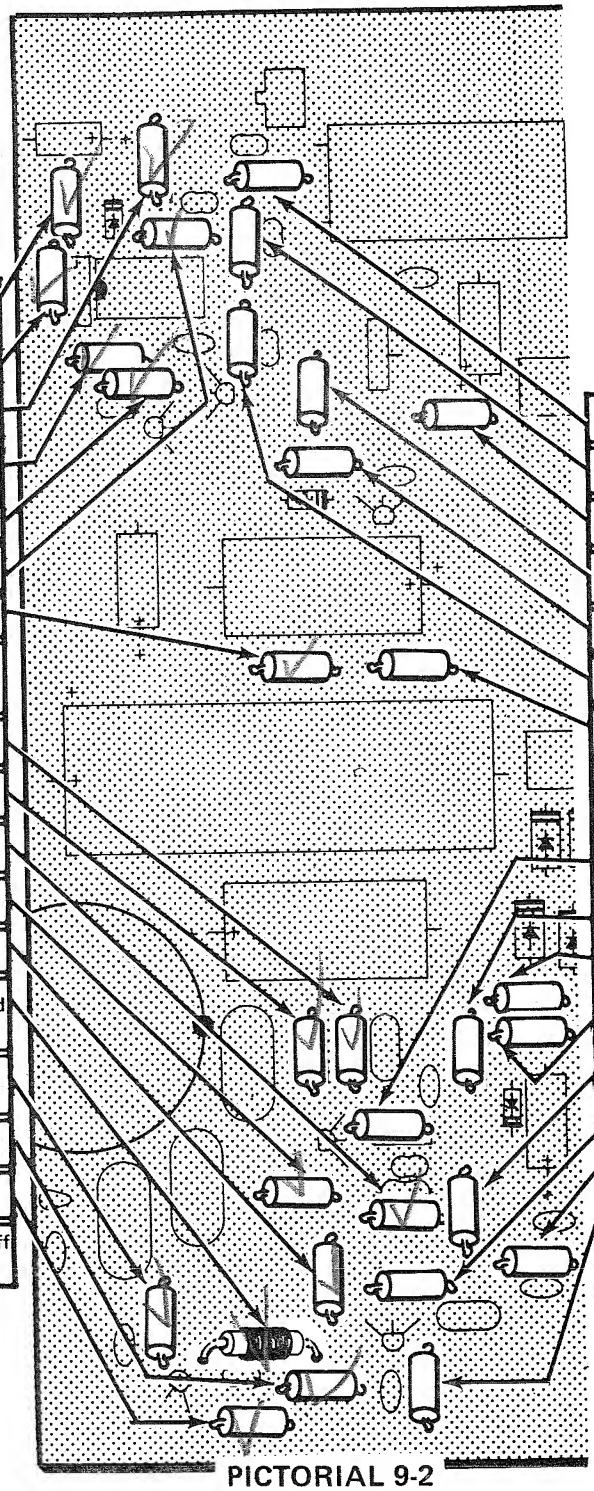
PICTORIAL 9-1



IDENTIFICATION
DRAWING

START

- ( ) 22 kΩ, 5% (red-red-orange-gold).
- ( ) 22 kΩ, 5% (red-red-orange-gold).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 100 kΩ (brown-black-yellow).
- ( ) 47 kΩ (yellow-violet-orange).
- ( ) 1000 Ω (brown-black-red).
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) 15 Ω, 5% (brown-green-black-gold).
- ( ) 1000 Ω (brown-black-red).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 10 kΩ (brown-black-orange).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) RF choke (#45-39). Carefully bend the leads toward the slots.
- ( ) 470 Ω (yellow-violet-brown).
- ( ) 15 kΩ (brown-green-orange).
- ( ) 3300 Ω (orange-orange-red).
- ( ) Solder all connections and cut off any excess lead lengths.



PICTORIAL 9-2

CONTINUE

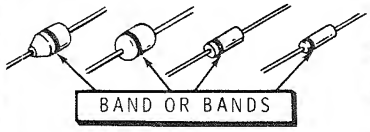
- ( ) 820 Ω, 5% (gray-red-brown-gold).
- ( ) 100 kΩ (brown-black-yellow).
- ( ) 220 Ω (red-red-brown).
- ( ) 4700 Ω (yellow-violet-red).
- ( ) 1000 Ω (brown-black-red).
- ( ) 100 kΩ (brown-black-yellow).
- ( ) 100 Ω (brown-black-brown).
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) 2200 Ω (red-red-red).
- ( ) 47 Ω (yellow-violet-black).
- ( ) 150 Ω (brown-green-brown).
- ( ) 150 Ω (brown-green-brown).
- ( ) 47 Ω (yellow-violet-black).
- ( ) 220 Ω (red-red-brown).
- ( ) 47 Ω (yellow-violet-black).
- ( ) 470 Ω (yellow-violet-brown).
- ( ) Solder all connections and cut off any excess lead lengths.

PROCEED TO PICTORIAL 9-3.

START

NOTE: Solder each diode and cut off any excess lead length as it is installed.

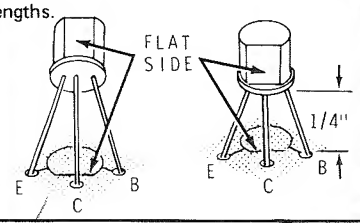
NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.



( ) 1N4149 diode (#56-56) at D601.

( ) Zener diode (#56-67) at ZD602.

Install each of the following transistors by lining up the flat side of the transistor with the flat outline on the circuit board. Then insert the transistor leads into their circuit board holes, which are indicated by E, C, and B. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.



( ) E844 transistor (#417-85) at Q602.

( ) E844 transistor (#417-85) at Q601.

( ) 2N5232A transistor (#417-91) at Q604.

( ) 1N2071 diode (#57-27).

( ) IN2071 diode (#57-27).

( ) 1N2071 diode (#57-27).

( ) 1N2071 diode (#57-27).

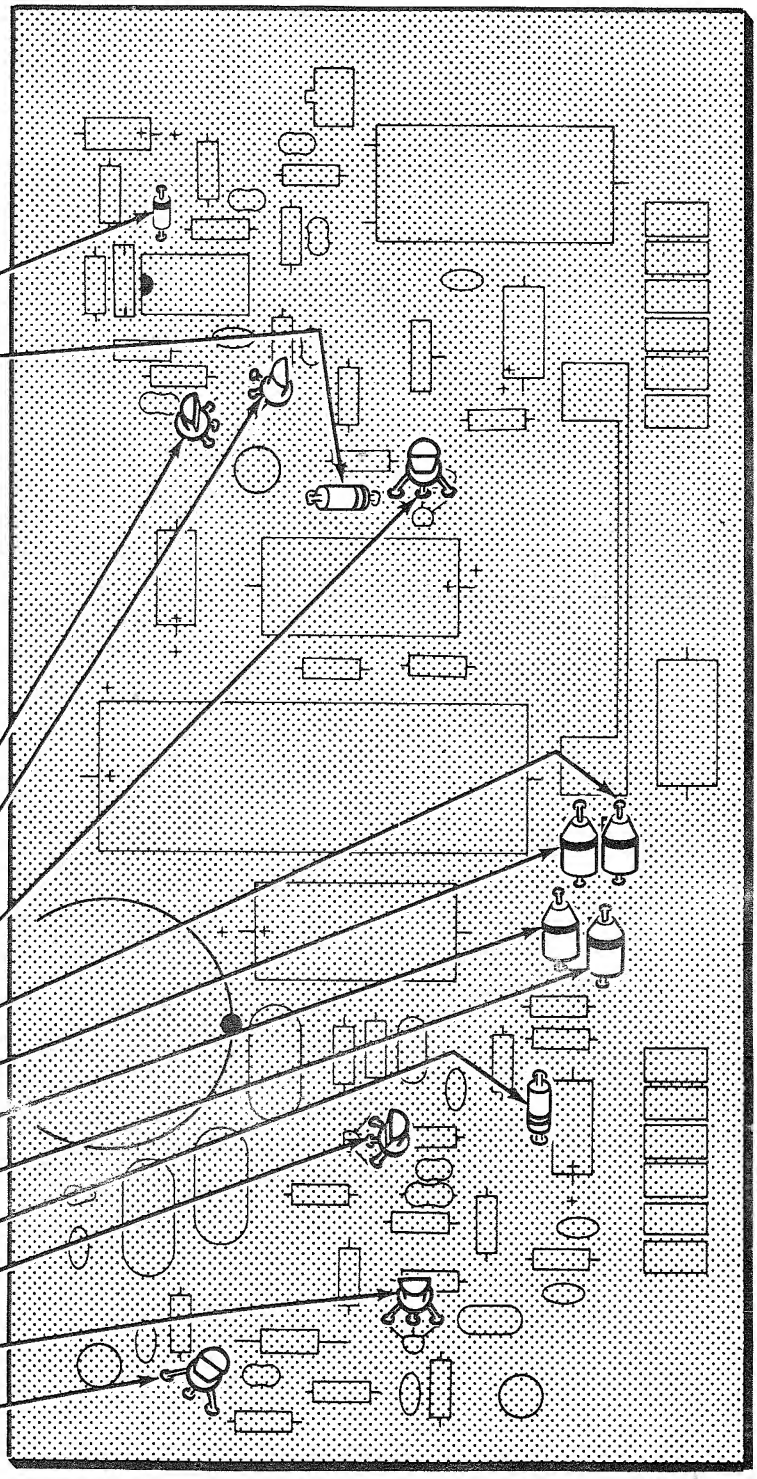
( ) Zener diode (#56-67).

( ) E844 transistor (#417-85) at Q605.

( ) 2N5232A transistor (#417-91) at Q606.

( ) 2N5232A transistor (#417-91) at Q607.

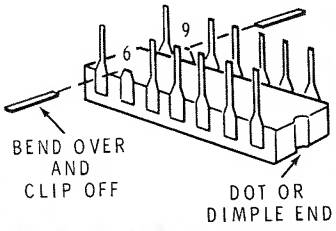
PROCEED TO PICTORIAL 9-4.



PICTORIAL 9-3

START

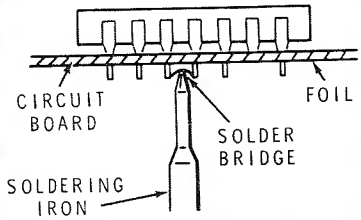
( ) Locate the MC724P integrated circuit (#443-8). Bend and clip off pins 6 and 9 as shown.



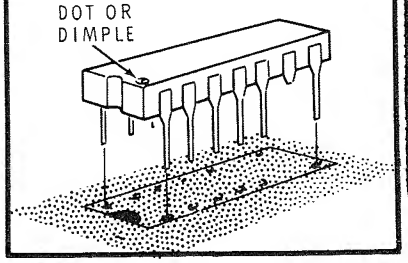
NOTE: Read this information carefully before you install the IC (integrated circuit) in the next step. First, be sure to position the IC as shown, with the dot or dimple pointing toward the dot on the circuit board.

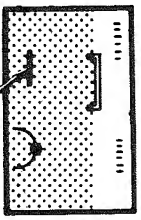
Use a small-tip soldering iron if possible. The IC pins are very close together. Therefore, be sure you do not bridge solder between pins on different foils. When removing the soldering iron, move the tip of the iron straight up from the pin to avoid bridging solder to another pin. Do not place the soldering iron tip between the IC pins when soldering, as this increases the possibility of a solder bridge.

If a solder bridge does occur, turn the circuit board foil side down as shown, and hold the soldering iron tip between the two points that are bridged. The solder will flow down the soldering iron tip.

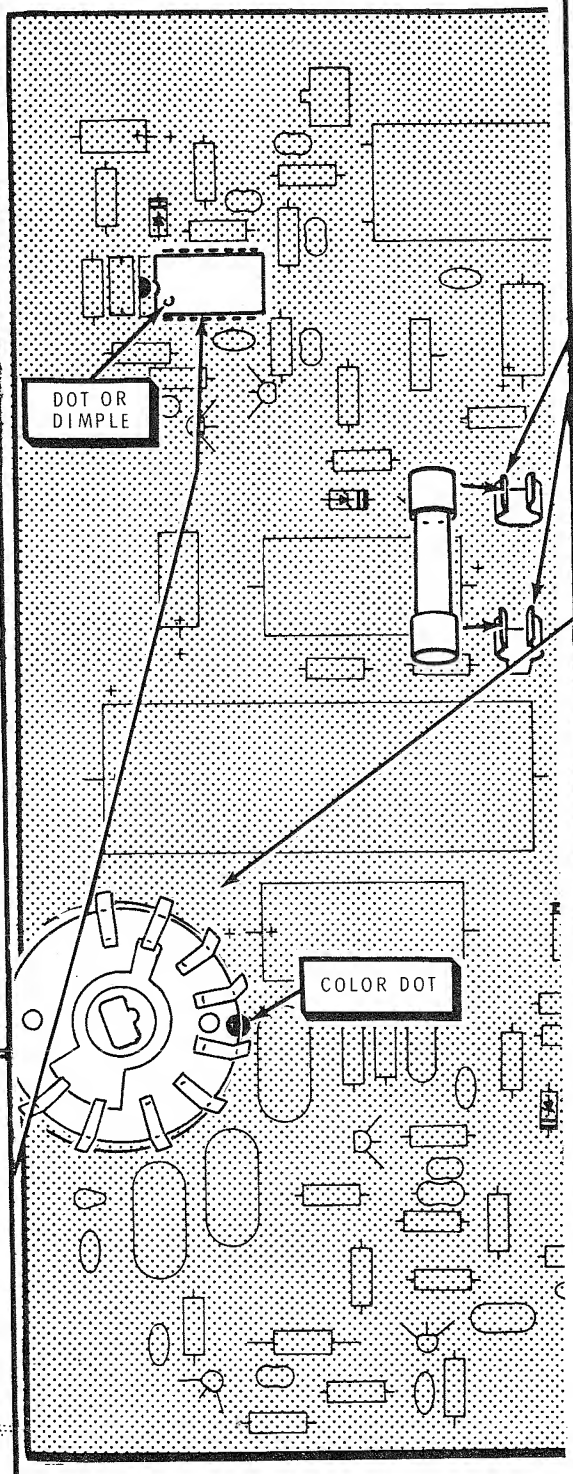


( ) Install the MC724P integrated circuit (#443-8) on the circuit board. Position the end with the dot to match the dot on the circuit board. Be very careful when inserting the pins in the holes, as they bend easily.





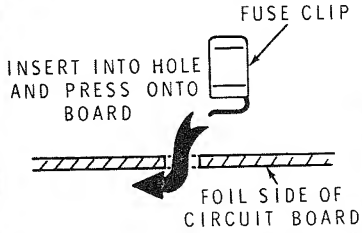
IDENTIFICATION DRAWING



PICTORIAL 9-4

CONTINUE

Mount the fuse clips in the following steps by inserting the indicated portion of the clip through the circuit board hole. Then press the clip against the edge of the circuit board hole until the clip is firmly installed. Do not solder the clip to the circuit board foil until instructed to do so.



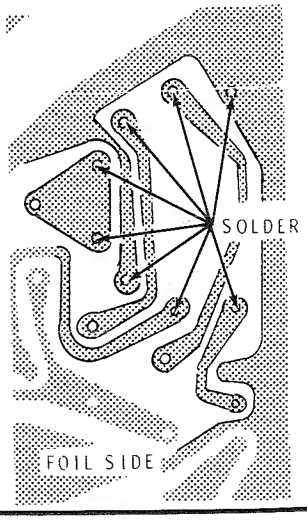
( ) Fuse clip.

( ) Fuse clip.

( ) Install the 1/2-ampere fuse into the fuse clips.

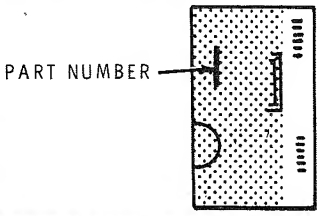
( ) Solder both fuse clips to the circuit board foils.

( ) Mount the switch wafer (blue dot) on the circuit board, making sure the color dots line up. Be sure to carefully insert the pins into their proper holes.

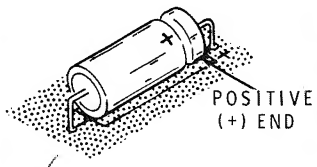


PROCEED TO PICTORIAL 9-5.

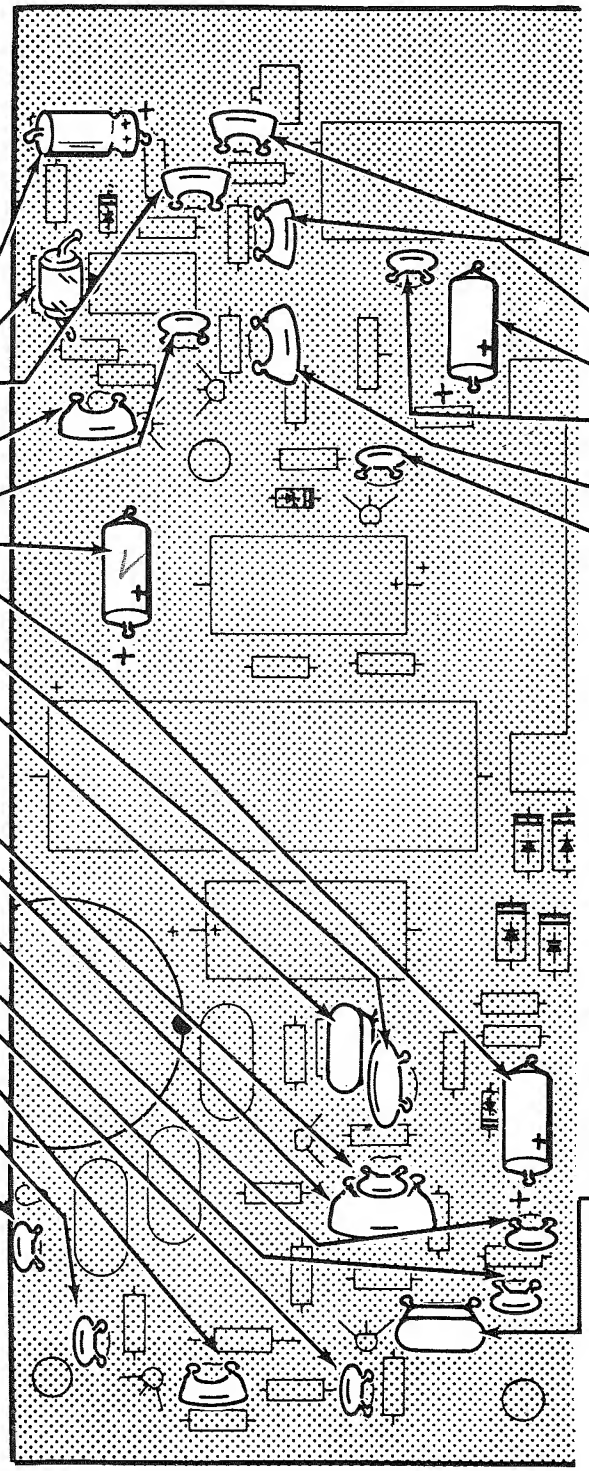
START



NOTE: When installing electrolytic capacitors, be sure to match the positive (+) marked end of the capacitor with the positive (+) mark on the circuit board.



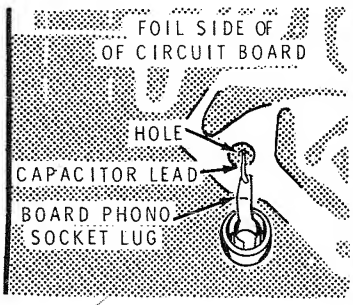
- ( ) 10 μF electrolytic.
- ( ) 1800 pF polystyrene.
- ( ) 15 pF mica.
- ( ) 62 pF mica.
- ( ) .001 μF ceramic.
- ( ) 2 μF electrolytic.
- ( ) 2 μF electrolytic.
- ( ) .05 μF ceramic.
- ( ) .1 μF Mylar.
- ( ) Solder all connections and cut off any excess lead lengths.
- ( ) 20 pF ceramic.
- ( ) 680 pF mica.
- ( ) .05 μF ceramic.
- ( ) .05 μF ceramic.
- ( ) .05 μF ceramic.
- ( ) 330 pF mica.
- ( ) .05 μF ceramic.
- ( ) .05 μF ceramic
- ( ) Solder all connections and cut off any excess lead lengths.



CONTINUE

- ( ) 22 pF mica.
- ( ) 62 pF mica.
- ( ) 2 μF electrolytic.
- ( ) .05 μF ceramic.
- ( ) 62 pF mica.
- ( ) .05 μF ceramic.
- ( ) Solder all connections and cut off any excess lead lengths.

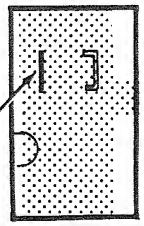
NOTE: When you install the following .1 μF Mylar capacitor, insert the capacitor lead from the indicated hole through the board phono socket lug. Solder the lead to the foil and to the lug. Solder the other lead to the foil and cut off all excess lead lengths.



- ( ) .1 μF Mylar.

PROCEED TO PICTORIAL 9-6.

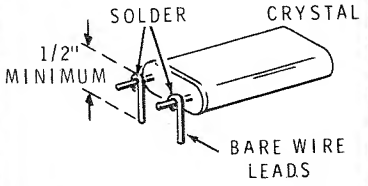
PICTORIAL 9-5



START

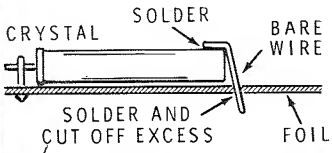
( ) Locate the 100 kHz crystal (#404-43), the bare wire and the 7-20 pF ceramic trimmer capacitor.

( ) Prepare the crystal by soldering a 3/4" length of bare wire to each crystal pin as shown.



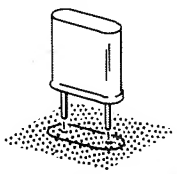
( ) Install the crystal on the circuit board by inserting the bare wire leads through their circuit board holes. Solder the leads to the foil and cut off any excess wire lengths.

( ) Bend a 1" length of bare wire and insert it through the circuit board hole at the opposite end of the crystal as shown. Solder the wire to the crystal and to the circuit board foil. Cut off any excess wire lengths.



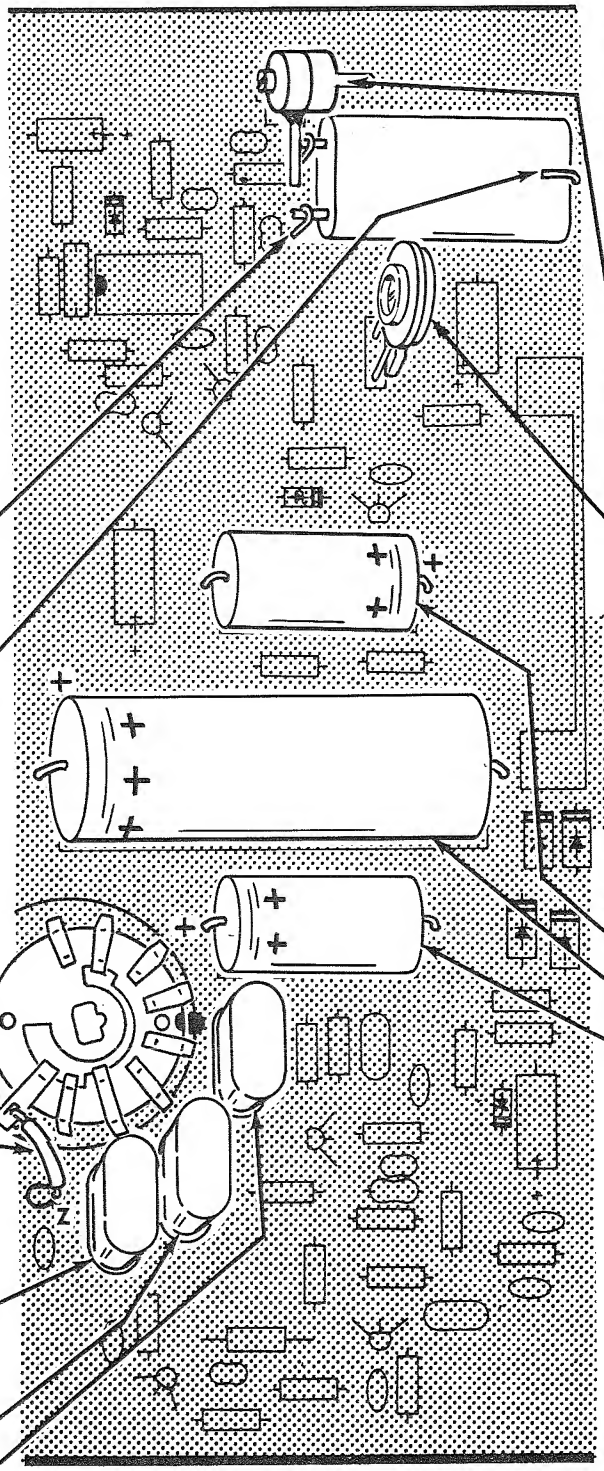
( ) Prepare a 1-1/4" blue wire. Connect this wire from lug 6 (S-1) of the switch wafer to hole Z (S-1) in the circuit board. Cut off any excess lead length from hole Z.

( ) 3392.110 kHz crystal (#404-280) (S-2).



( ) 3393.6 kHz crystal (#404-205) (S-2).

( ) 3396.4 kHz crystal (#404-206) (S-2).

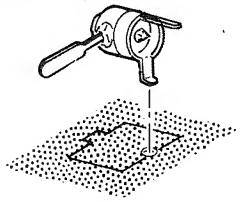


PICTORIAL 9-6

CONTINUE

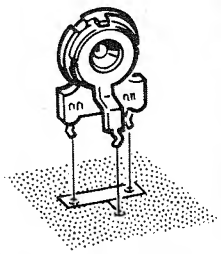
NOTE: Solder each of the following parts as it is installed and cut off any excess lead lengths.

( ) Bend the two indicated ceramic trimmer capacitor lugs to the positions shown.



( ) Install the ceramic trimmer capacitor on the circuit board and solder the lug extending through the circuit board hole to the foil. Then solder the other bent lug to the indicated crystal lug. Be sure this is a good solder connection.

( ) 2000 Ω (2 k) linear control (#10-294).



( ) 50 Ω, 5-watt resistor.

( ) 500 μF electrolytic capacitor.

( ) 2000 μF electrolytic capacitor.

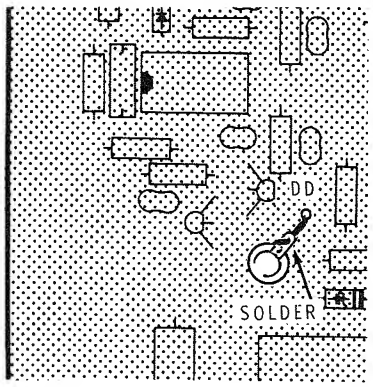
( ) 500 μF electrolytic capacitor.

PROCEED TO PICTORIAL 9-7.

START

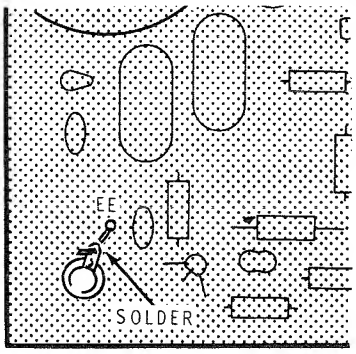
( ) Place the circuit board foil-side-up as shown. The components installed in the following steps will all be on the foil side of the circuit board.

( ) Board phono socket. Solder the socket so the socket lug is toward the indicated hole as shown below.

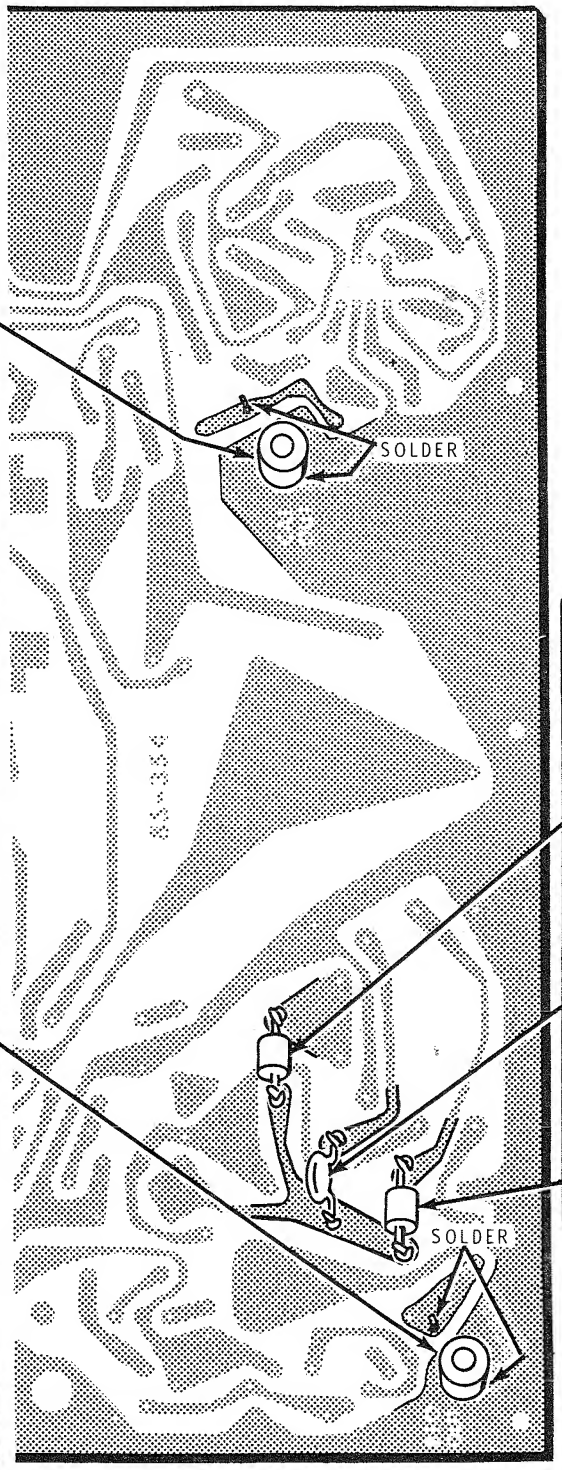


( ) Solder one end of a 1" length of bare wire to the board phono socket lug as shown above. Insert the other end of the lead through circuit board hole DD. Solder the lead to the foil side of the circuit board and cut off any excess lead lengths.

( ) Board phono socket. Solder the socket so the socket lug is toward the indicated hole as shown below.



( ) Solder a 1" length of bare wire to the board phono socket lug as shown above. Insert the other end of the lead through circuit board hole EE. Solder the lead to the foil side of the circuit board and cut off any excess lead lengths.



PICTORIAL 9-7

CONTINUE

( ) Cut each lead of a 2.2 pF phenolic capacitor (red-red-white) to 3/8".

NOTE: When installing the capacitors in the following steps, be sure the leads touch only the foils they are soldered to.

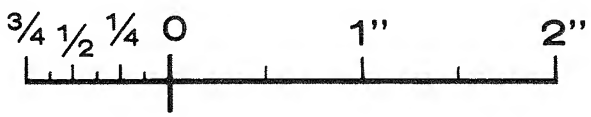
( ) Solder each lead of the 2.2 pF phenolic capacitor to one of the indicated pins.

( ) Cut each lead of a 5 pF ceramic capacitor to 3/8".

( ) Solder each lead of a 5 pF ceramic capacitor to one of the indicated pins.

( ) Cut each lead of a 2.2 pF phenolic capacitor (red-red-white) to 3/8".

( ) Solder each lead of the 2.2 pF phenolic capacitor to one of the indicated pins.



HEAT-SINK ASSEMBLY

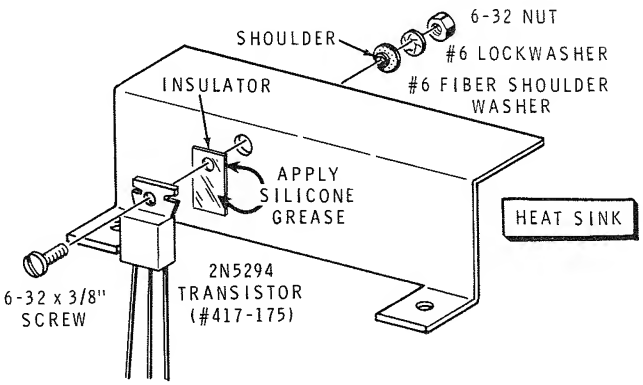
Refer to Detail 9-8A for the following steps.

( ) Locate the 2N5294 transistor (#417-175), the heat sink, an insulator (packed between two pieces of cardboard), and the silicone grease from previous steps.

( ) Apply a liberal amount of silicone grease to both sides of the insulator. Then position the insulator on the heat sink. Save the grease for later use.

NOTE: In the next step, be sure to mount the metal side of the transistor toward the heat sink.

( ) Mount the transistor on the insulator and heat sink with a 6-32 x 3/8" screw, a #6 fiber shoulder washer, a #6 lockwasher, and a 6-32 nut. CAUTION: Be sure the shoulder washer is properly seated in the heat sink hole.



Detail 9-8A

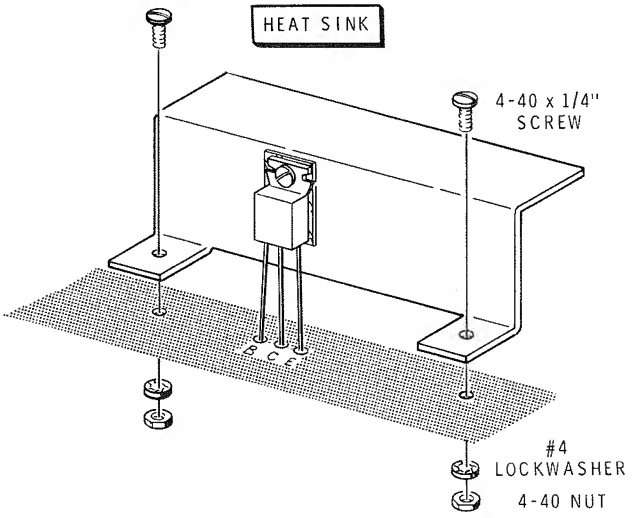
Refer to Pictorial 9-8 for the following steps.

( ) Refer to Detail 9-8B and slightly spread the two outer transistor leads with your finger. Then mount the heat sink to the circuit board with two 4-40 x 1/4" screws, two #4 lockwashers, and two 4-40 nuts. Be sure the transistor leads are inserted into their correct holes.

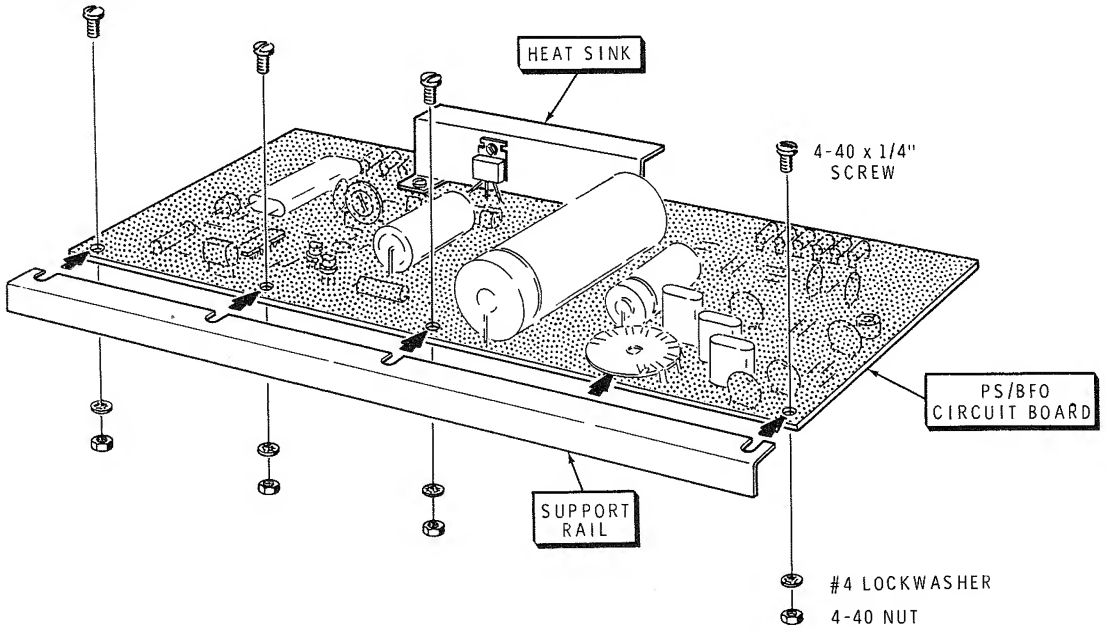
( ) Solder the transistor leads to the foil and cut off the excess lead lengths.

( ) Mount the support rail to the circuit board with four 4-40 x 1/4" screws, four small lockwashers, and four 4-40 nuts.

( ) Set the completed circuit board aside until it is called for.



Detail 9-8B



PICTORIAL 9-8

PLUG BOARD AND EXTENDER ACCESSORIES

PARTS LIST

Unpack package #5 and check each part against the following parts list. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 32). This parts package contains all the parts for the plug board, large and small extender boards, extender cable, and extender block, except those required from pack #6.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
1	432-98	4	Switch-board plug
2	432-77	8	Switch-board connector
3	432-124	36	Circuit board connector
4	255-108	3	Extender block
5	262-24	18	Extender pins
6	434-42	1	Chassis phono socket
7	438-4	1	Phono plug

ITEMS FROM PACK #6

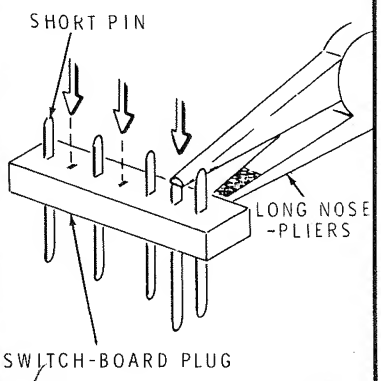
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
	85-349-1	1	Plug board
	85-355	1	Small extender board
	85-356	1	Large extender board

STEP-BY-STEP ASSEMBLY

START

( ) Locate the four Switch-Board plugs.

( ) Use a pair of long-nose pliers to remove the three indicated pins from each plug as shown. NOTE: Save four of the removed pins, as they will be used in assembling the next group of circuit boards.



(√) Locate the plug board (#85-349-1) and position it foil side down as shown.

In the following steps, mount each Switch-Board plug to the plug board by inserting the short pins into their corresponding plug board holes. Push the Switch-Board plug firmly against the plug board. Then solder each short pin to the foil.

( ) Switch-Board plug.

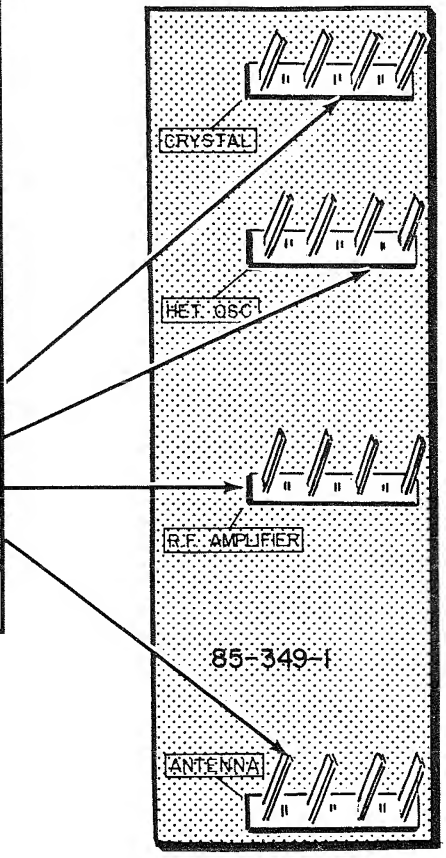
( ) Switch-Board plug.

( ) Switch-Board plug.

( ) Switch-Board plug.

( ) Set the completed plug board aside until it is called for.

FINISH



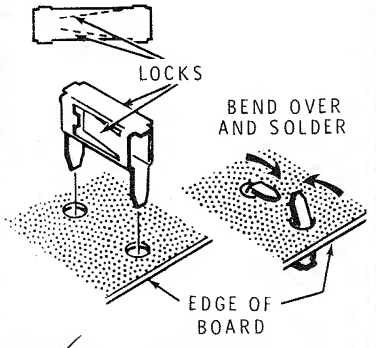
PICTORIAL 10-1

START

( ) Refer to Pictorial 1-1 (fold-out from Page 4) and prepare eight connectors as shown.

( ) Position the small extender board (#85-355) foil side down.

When installing a Switch-Board connector, insert the connector prongs through the small extender board so the locks of the connector are positioned as shown. Note the edge of the board. Press the connector firmly against the board and bend the prongs against the board with a screwdriver. Solder the prongs to the board.



( ) Connector.

( ) Connector.

( ) Connector.

( ) Connector.

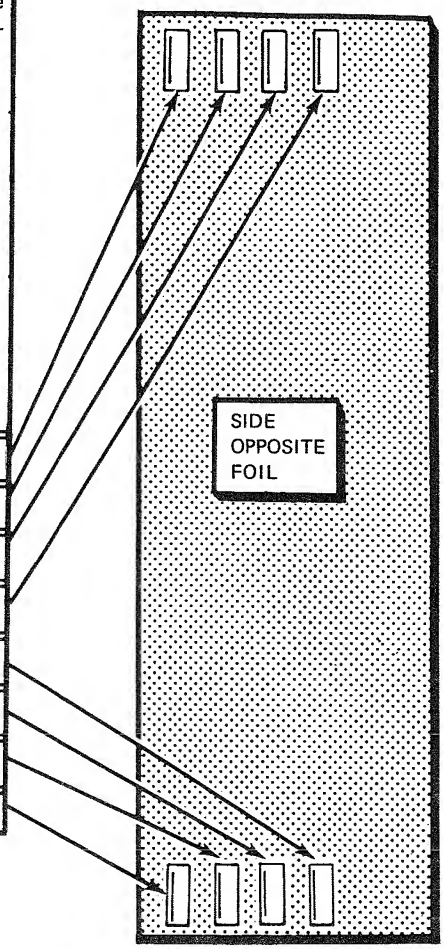
( ) Connector.

( ) Connector.

( ) Connector.

( ) Connector.

PROCEED TO PICTORIAL 11-2.

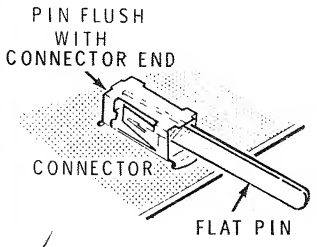


PICTORIAL 11-1

START

( ) Locate four of the flat pins you removed from the 7-pin Switch-Board plugs in previous pictorials.

( ) Insert one pin into each of the four indicated connectors.



( ) Locate the previously assembled crystal Switch-Board (#85-348-1).

( ) Carefully plug the crystal Switch-Board onto the pins inserted in the connectors.

CAUTION: Solder only the connectors on the small extender board in the following steps.

( ) Solder the pin to the connector.

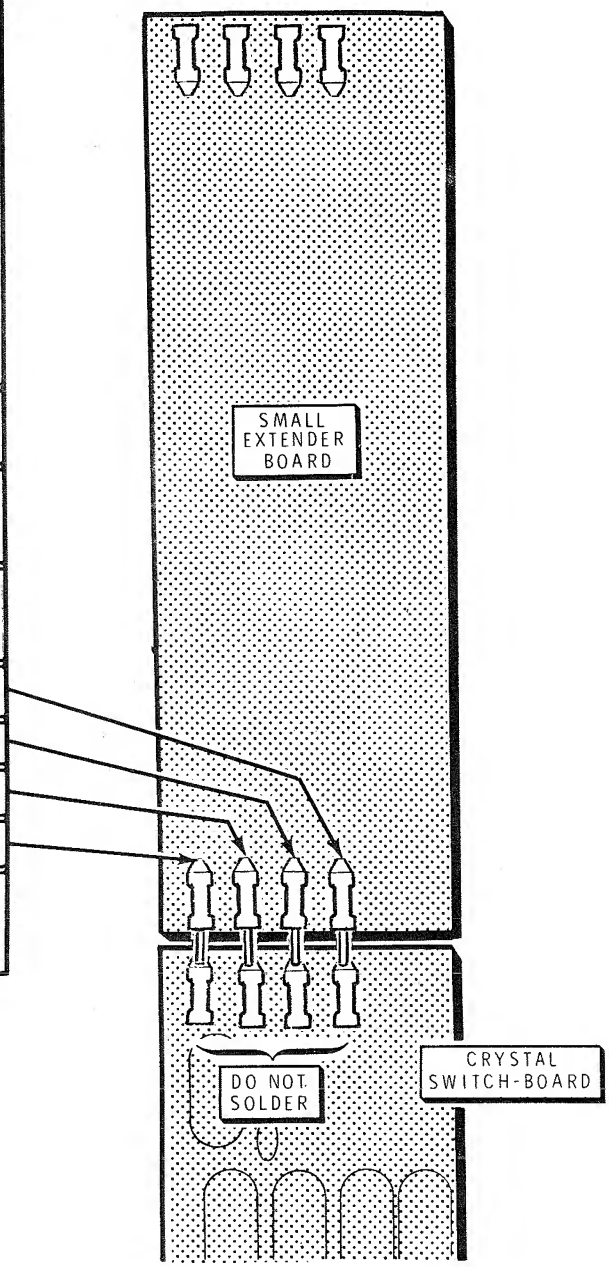
( ) Solder the pin to the connector.

( ) Solder the pin to the connector.

( ) Solder the pin to the connector.

( ) Unplug the crystal Switch-Board from the small extender board and set both boards aside.

FINISH

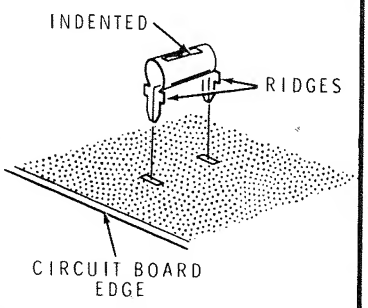


PICTORIAL 11-2

START

( ) Place the large extender board (#85-356) foil side down.

Install each circuit board connector in the following manner. Note that, on one end of the connector, the spring contacts are indented. This end of the connector should face away from the edge of the circuit board. Insert the mounting tabs through the circuit board until the ridges of the connector are firmly against the circuit board. Solder the tabs to the foil.



( ) 6 circuit board connectors.

( ) 6 circuit board connectors.

( ) 6 circuit board connectors.

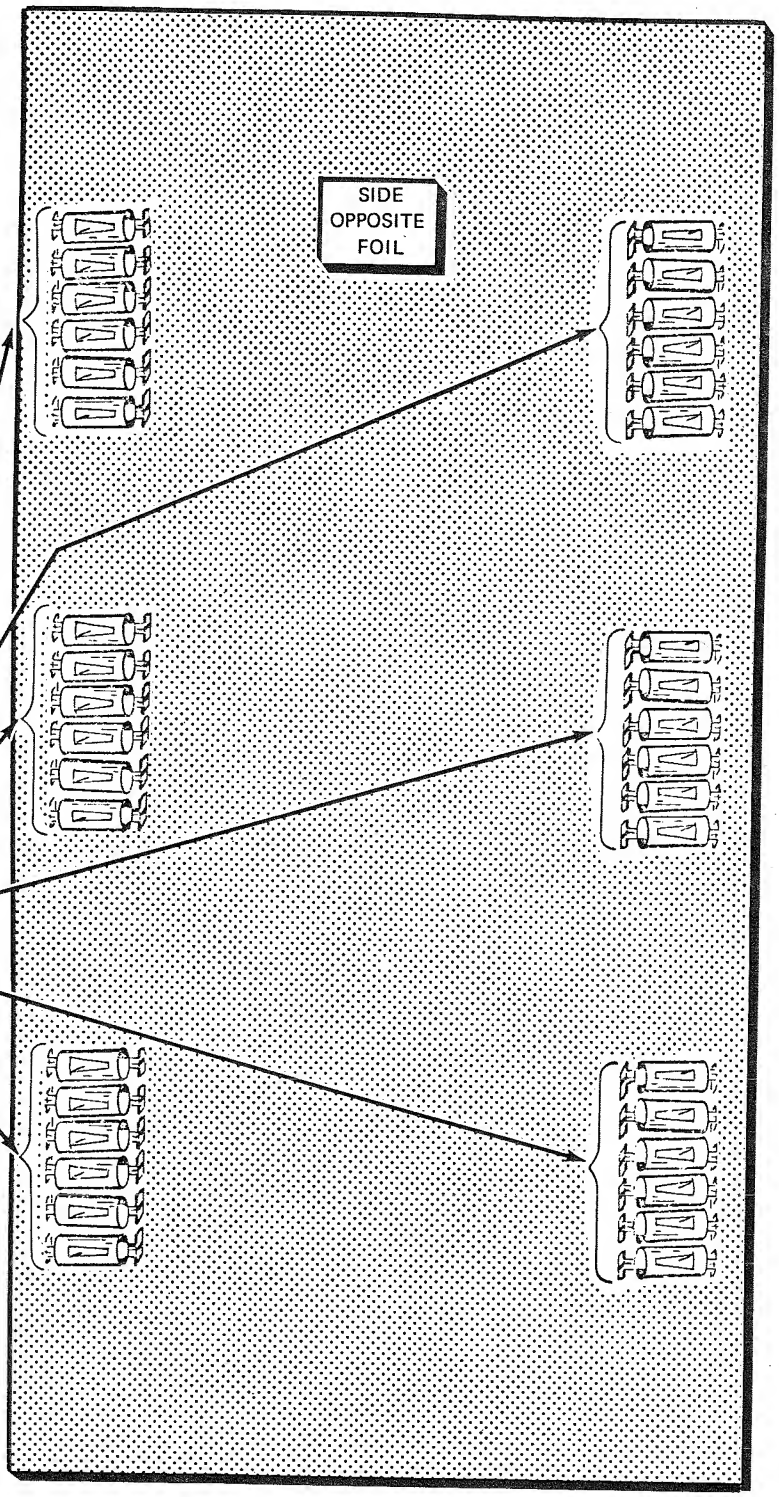
( ) 6 circuit board connectors.

( ) 6 circuit board connectors.

( ) 6 circuit board connectors.

( ) Check the foil side of the board carefully and make sure there are no solder bridges between foils.

FINISH



PICTORIAL 12-1

EXTENDER BLOCK ASSEMBLY

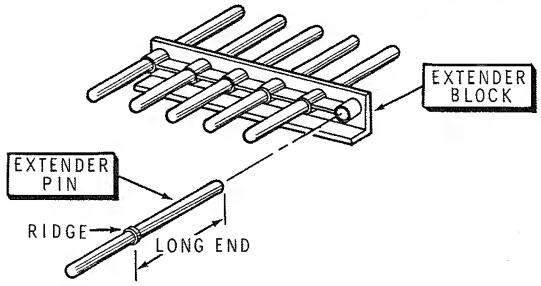
Refer to Pictorial 12-2 for the following steps.

( ) Locate the three extender blocks and the eighteen extender pins.

( ) Position an extender block as shown, and insert the long end of an extender pin into the block. Push the pin into the block until the ridge is against the block.

( ) Install an extender pin in each of the five remaining holes in the extender block.

( ) Install extender pins in the remaining two extender blocks.



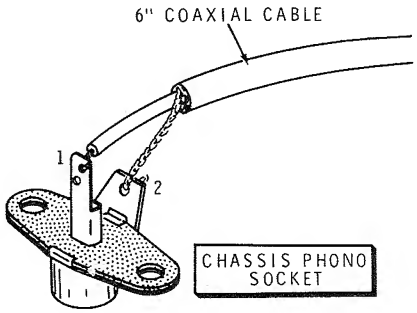
PICTORIAL 12-2

EXTENDER CABLE ASSEMBLY

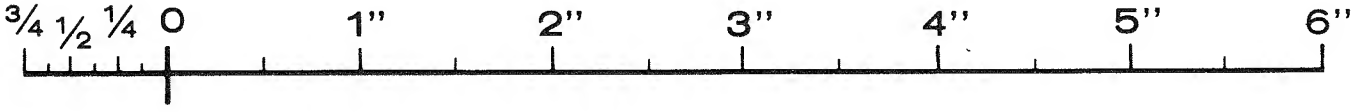
( ) Refer to Pictorial 1-3 (fold-out from Page 4) and prepare a 6" coaxial cable with phono plug.

( ) Refer to Pictorial 12-3 and connect the inner lead of the coaxial cabel to lug 1 (S-1) and the shield lead to lug 2 (S-1) of a chassis phono socket.

NOTE: The small extender board, large extender board, extender block assemblies, and extender cable can be set aside. They are service aids and are not required for the remaining kit assembly.



PICTORIAL 12-3



CHASSIS

PARTS LIST

Unpack package #6 which is all of the remaining parts, and check each part against the following parts list. The key numbers correspond to the numbers on the Chassis Parts Pictorial (fold-out from Page 61).

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS			
1/2-Watt			
1	1-1	1	47 Ω (yellow-violet-black)
	1-2	2	68 Ω (blue-gray-black)
	1-42	1	270 Ω (red-violet-brown)
	1-9	1	1000 Ω (brown-black-red)
5-Watt			
2	3-17-5	1	50 Ω
DIODE-CONTROLS			
3	56-56	1	1N4149 diode
4	19-143	1	500 Ω linear control with SPST switch
	19-95	1	10 kΩ AUD (audio) control with SPST switch
5	10-34	1	600 Ω control

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
CAPACITORS-TRAP			
6	28-3	1	.56 pF phenolic capacitor
7	21-72	2	.005 μF ceramic capacitor (1.4 kV line bypass)
8	26-74	1	24-194 pF variable capacitor
9	40-546	1	Tune trap
SWITCHES			
10	63-563	1	4-position
	63-564	1	3-position
11	63-569	1	3-wafer (without shaft)
12	63-572	1	3-position

CONNECTORS

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
	432-27	1	Line cord adapter
13	432-76	1	AC power socket
14	432-120	6	Pin socket
15	432-125	5	Circuit board plug
16	434-2	1	Accessory socket
17	434-42	14	Chassis phono socket
18	434-88	2	Lamp socket (short bracket)
19	434-90	1	Lamp socket (long bracket)
20	436-20	1	Phone jack
21	438-4	26	Phono plug
22	438-25	1	LMO load plug
23	438-6	1	Accessory plug
24	440-1	1	Accessory plug cap

GROMMETS-TERMINAL STRIPS

25	73-3	6	1/2" grommet
26	73-2	2	3/4" grommet
27	431-10	1	3-lug terminal strip
28	431-11	1	5-lug terminal strip

HARDWARE

#3 Hardware

29	250-251	2	3-48 x 3/8" flat head screw
30	252-1	2	3-48 nut
31	254-7	2	#3 lockwasher

#4 Hardware

32	250-156	1	4-40 x 1/8" setscrew
33	250-285	8	4-40 x 1/4" screw
34	252-15	14	4-40 nut
35	254-9	17	#4 lockwasher

#6 Hardware

36	250-40	2	6-32 x 1-1/2" screw
37	250-56	7	6-32 x 1/4" screw
38	250-89	52	6-32 x 3/8" screw
39	250-218	2	6-32 x 3/8" phillips screw
40	250-364	8	6-32 x 7/8" screw
41	250-327	1	6-32 x 1/4" flat head screw
42	250-170	41	#6 x 1/4" sheet metal screw
43	252-3	63	6-32 nut
44	252-85	2	6-32 speednut
45	253-60	8	#6 flat washer
46	254-1	65	#6 lockwasher
47	255-23	4	6-32 x 15/32" tapped spacer
48	259-1	6	#6 large solder lug
49	259-6	1	#6 small solder lug

#8 Hardware

50	250-87	4	8-32 x 3/16" screw
51	250-137	4	8-32 x 3/8" screw
52	250-93	14	8-32 x 1/4" setscrew
53	254-2	10	#8 lockwasher
54	252-4	4	8-32 nut

Control Hardware

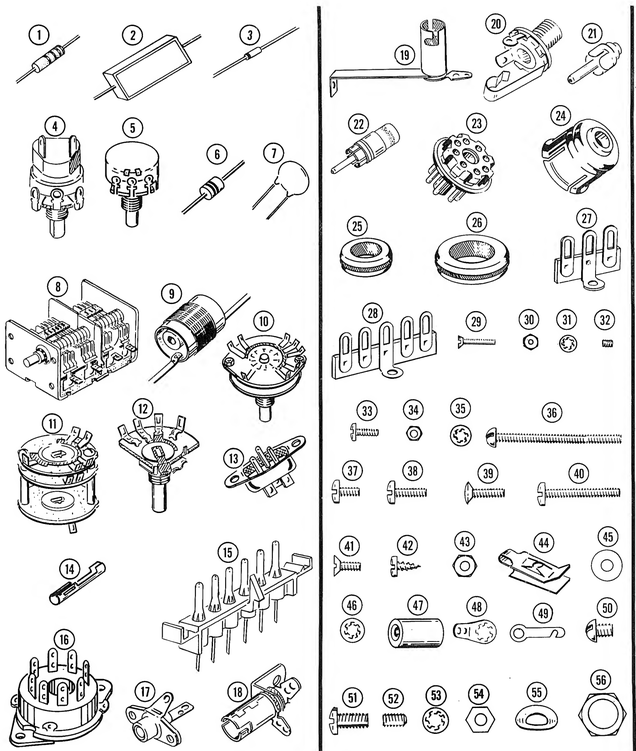
55	253-36	2	Control spring washer
56	252-7	11	Control nut
57	253-10	11	Control flat washer
58	254-5	8	Control lockwasher
59	259-10	3	Control solder lug

SHEET METAL PARTS

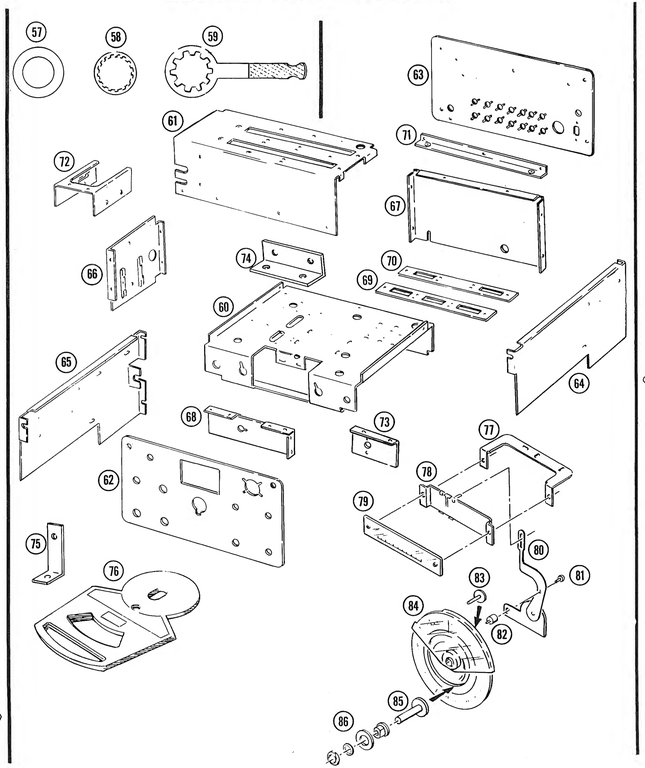
	90-415	1	Cabinet
60	200-556	1	Front chassis
61	200-557	1	Rear chassis
62	203-657-2	1	Front panel
63	203-656	1	Rear panel

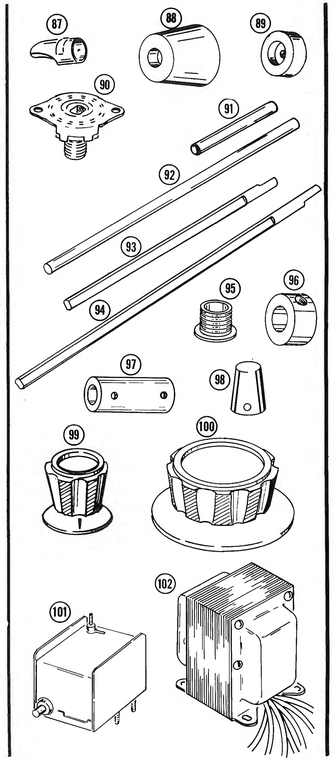
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Sheet Metal Parts (cont'd.)			
64	100-927	1	Right side panel
65	203-735	1	Left side panel
66	100-928	1	Left subpanel
67	206-460	1	IF shield
68	206-461	2	RF shield
69	205-692	1	3-position connector plate
70	205-693	1	2-position connector plate
71	100-929	1	Rear panel bracket
72	100-930	1	RTTY bracket
73	206-504	1	Switch bracket
74	204-557	2	Capacitor bracket
75	204-363	1	Angle bracket
DIAL PARTS			
76	446-40	1	Escutcheon
	100-450		Dial drive assembly
	Consisting of:		
77	204-553	1	Dial-mounting bracket
78	100-443	1	Dial pointer assembly
79	464-30-1	1	Plastic dial window
80	100-447	1	Dial pointer drive arm
81	250-63	1	3-48 x 1/8" screw
82	266-74	1	Nylon spiral follower
83	100-445	1	Zero-set drive pulley (small)
84	100-449	1	Circular dial
85	100-444	1	Dial drive pulley (large)
86	455-42	1	Drive shaft bushing assembly
MISCELLANEOUS MECHANICAL			
87	206-86	3	Pilot lamp shield
88	255-59	2	Foot spacer
89	261-9	4	Foot
90	266-159	1	5-position switch detent
	266-160	1	9-position switch detent
	391-34	1	Blue and white label
	391-65	1	SB-303 nameplate
91	453-90	1	1-7/8" shaft
92	453-193	1	10-3/4" shaft

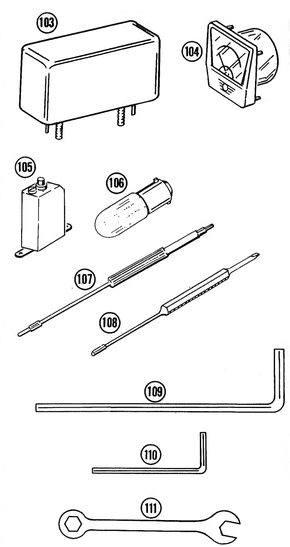
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous Mechanical (cont'd.)			
93	453-194	1	7-1/2" shaft
94	453-195	1	11-3/8" shaft
95	455-6	2	Bushing
96	455-15	2	Shaft collar
97	456-7	2	Coupling
98	462-175	1	Zero set knob
99	462-191	9	Small knob
100	462-193	1	Large knob
	489-1	1	Sandpaper
MISCELLANEOUS ELECTRICAL			
101	110-48	1	LMO (linear master oscillator)
102	54-242	1	Power transformer
103	404-283	1	SSB crystal filter
104	407-99	1	Meter
105	65-29	1	Circuit breaker
106	412-20	3	#47 frosted pilot lamp
WIRE			
	89-30	1	Line cord
	134-212	1	Wire harness
	343-5	1	RG-62/U coaxial cable
	344-51	1	Brown wire
	344-52	1	Red wire
	344-53	1	Orange wire
	344-54	1	Yellow wire
TOOLS			
107	490-1	1	Large alignment tool
108	490-109	1	Small alignment tool
109	490-85	1	Long allen wrench
110	490-23	1	Small allen wrench
111	490-19	1	1/4" open-end wrench

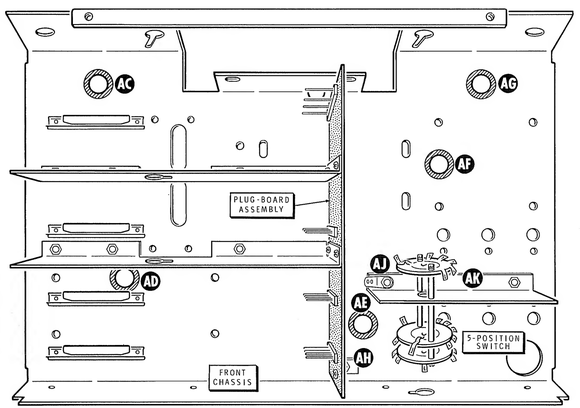


CHASSIS PARTS PICTORIAL

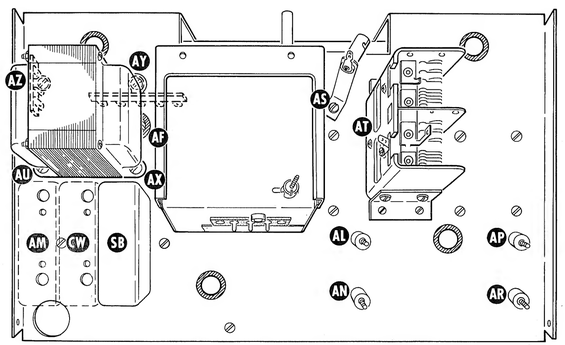








PICTORIAL 13-3



PICTORIAL 13-4

STEP-BY-STEP ASSEMBLY

COAXIAL CABLE PREPARATION

NOTE: All coaxial cables, with phono plugs, will be prepared at this time. They will be prepared in the order in which they will be used. Set them aside in this order until they are called for. Both ends of each coaxial cable will be prepared, in the same manner, only the lengths will vary.

Refer to Pictorial 13-1 for the following steps.

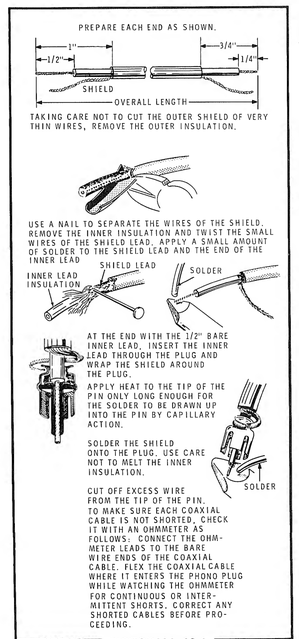
( ) Prepare the following lengths of small coaxial cable and install a phono plug on one end of each cable as shown:

~~4 1/2"~~	5"
~~12"~~	~~12"~~
~~14"~~	~~4"~~
~~17"~~	9"

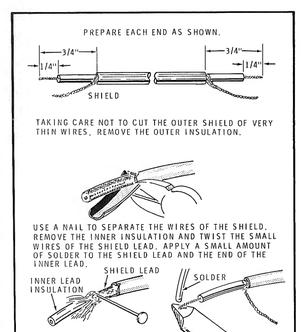
( ) Check each prepared coaxial cable with an ohmmeter to be sure it is not shorted.

NOTE: Three coaxial cables will be prepared in the next step. Set them aside until they are called for. Do not install phono plugs on these cables.

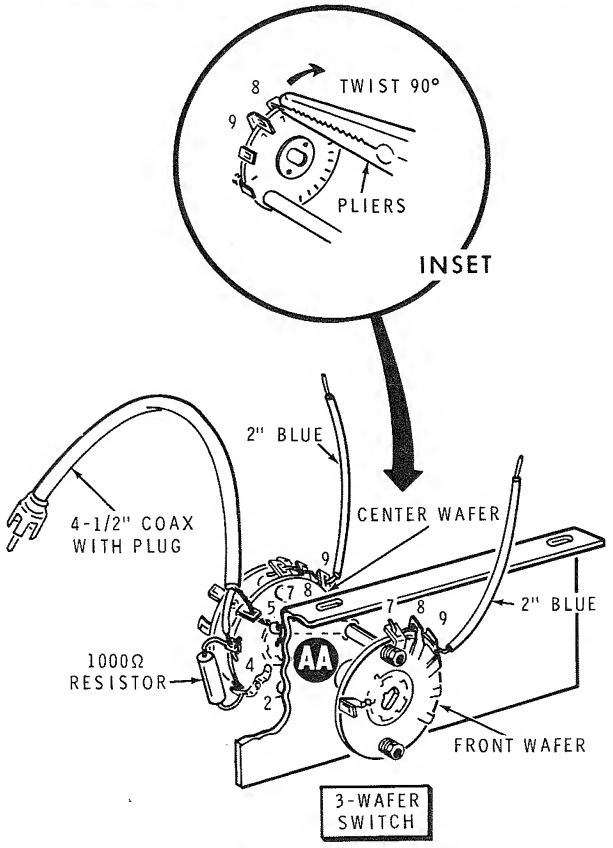
( ) Refer to Detail 13-1A and prepare one 14" and three 9" lengths of small coaxial cable:



PICTORIAL 13-1



Detail 13-1A



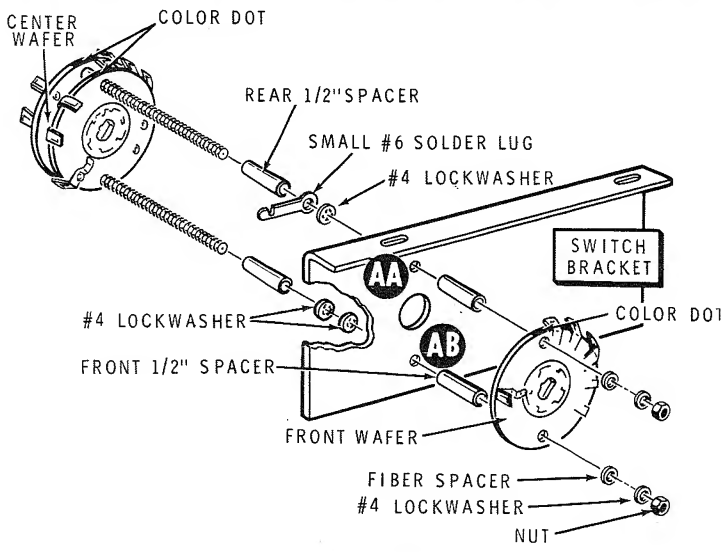
PICTORIAL 13-2

3-WAFER SWITCH PREPARATION

Refer to Pictorial 13-2 for the following steps.

( ) Refer to Detail 13-2A and carefully disassemble the 3-wafer switch (#63-569) up to the rear 1/2" spacer, exactly as shown. Then carefully reassemble the switch on the switch bracket (#206-504) with a #4 lockwasher, a small #6 solder lug at AA, and two #4 lockwashers at AB. Position the small #6 solder lug exactly as shown and align the color dots on the switch wafers.

( ) Cut two 2-1/2" lengths of blue wire. Remove 1/4" of insulation from one end of both wires and 1" of insulation from the other end of both wires.



Detail 13-2A

NOTE: When a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.

( ) Carefully twist lugs 8 and 9 of the center and the front switch wafers 90 degrees. Refer to the inset drawing.

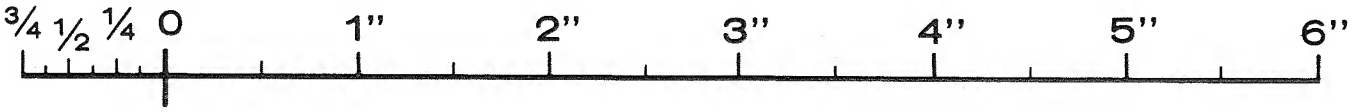
( ) Insert the 1" bare wire end of one of the blue wires through lug 9 (S-2), through lug 8 (S-2), to lug 7 (S-1) of the center wafer of the 3-wafer switch.

( ) Insert the 1" bare wire end of the other blue wire through lug 9 (S-2), through lug 8 (S-2), to lug 7 (S-1) of the front wafer of the 3-wafer switch.

( ) Locate the previously prepared 4-1/2" coaxial cable with plug. Insert the shield lead through lug 5 of the center wafer (S-2), to the small #6 solder lug at AA (S-1). Connect the inner lead to lug 4 of the center wafer (NS).

( ) Connect a 1000 Ω (brown-black-red) resistor between lugs 2 (S-1) and 4 (S-2) of the center wafer.

Set aside the prepared 3-wafer switch until it is called for.



FRONT CHASSIS PARTS MOUNTING

Refer to Pictorial 13-3 (fold-out from Page 62) for the following steps.

( ) Locate the front chassis and position it on your work area as shown.

( ) Install 1/2" rubber grommets in the chassis at AC, AD, AE, AF, and AG.

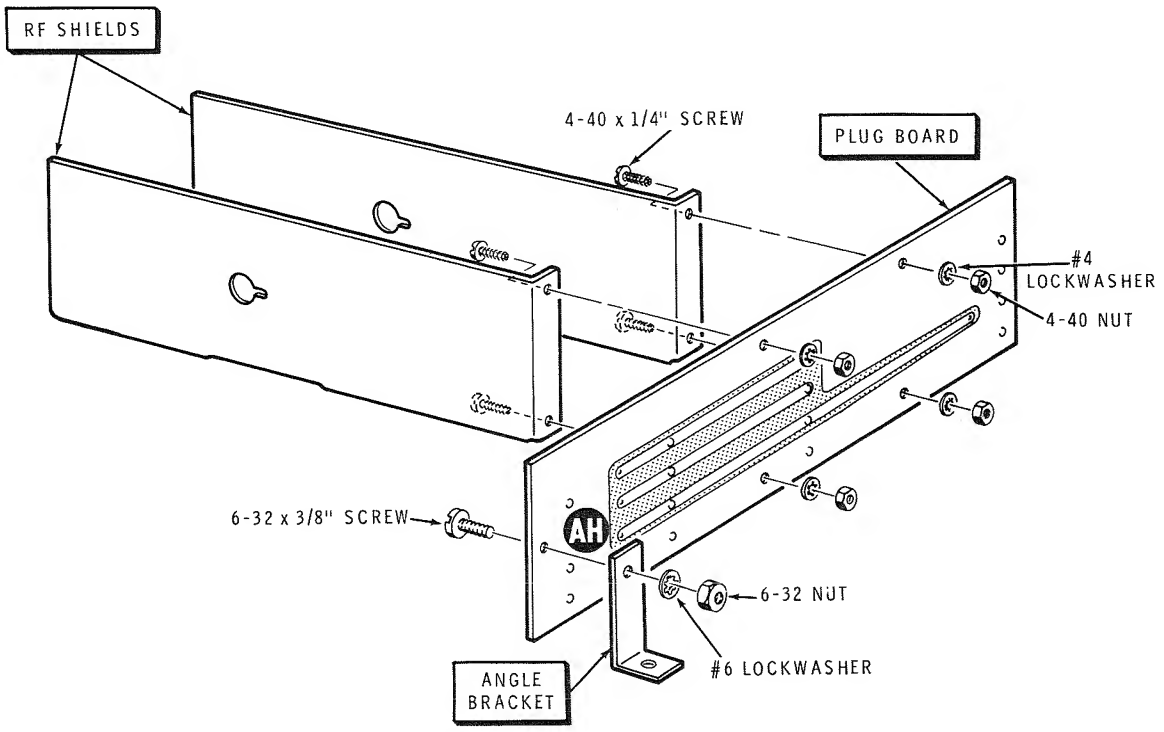
( ) Locate the plug board (#85-349-1) and the two RF shields.

NOTE: When hardware is called for in a step, only the screw size will be given. For instance, if "6-32 x 3/8" hardware" is called for, it means that a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut should be used. The Detail referred to in the step will show the proper number of lockwashers to use.

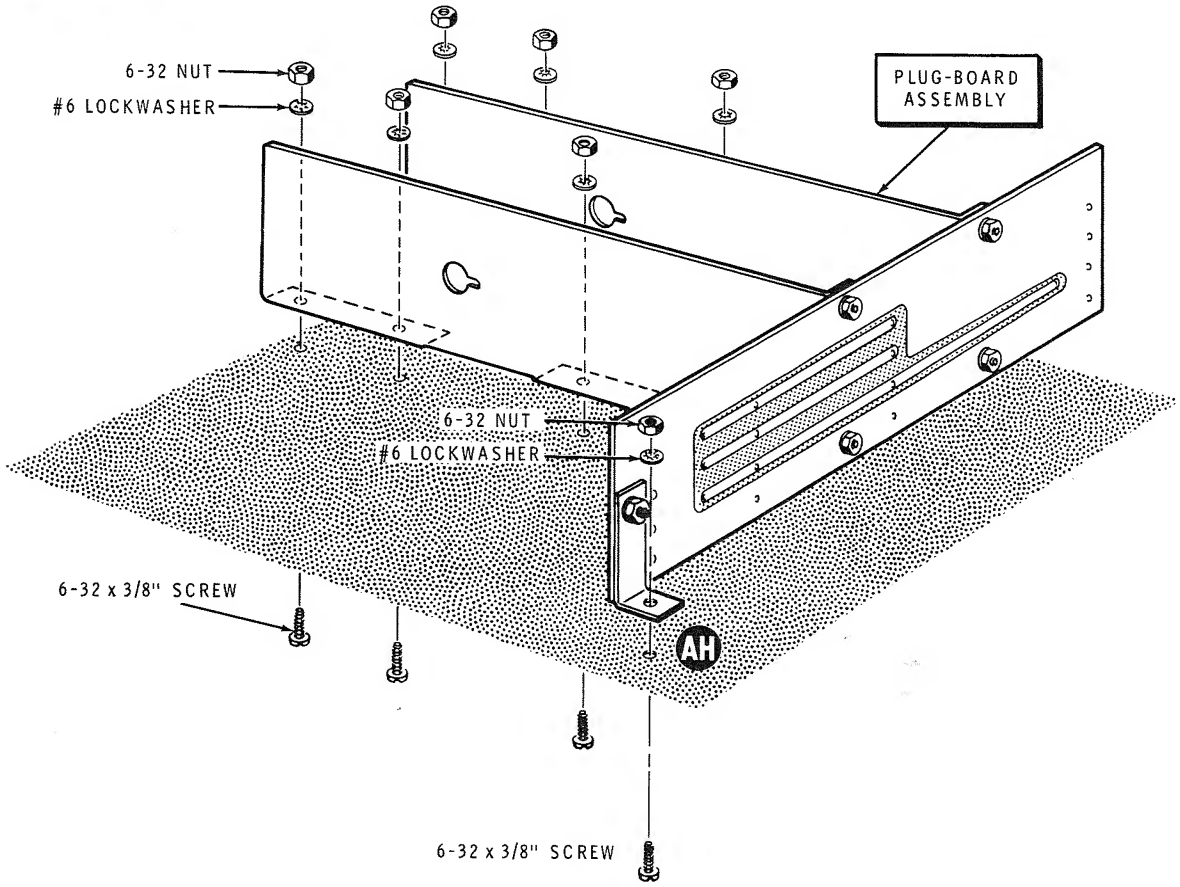
( ) Mount one of the RF shields to the plug board with 4-40 x 1/4" hardware at both mounting holes as shown in Detail 13-3A.

( ) In a similar manner, mount the other RF shield to the plug board with 4-40 x 1/4" hardware at both mounting holes.

( ) Again, refer to the Detail and mount angle bracket AH to the plug board with 6-32 x 3/8" hardware.



Detail 13-3A



Detail 13-3B

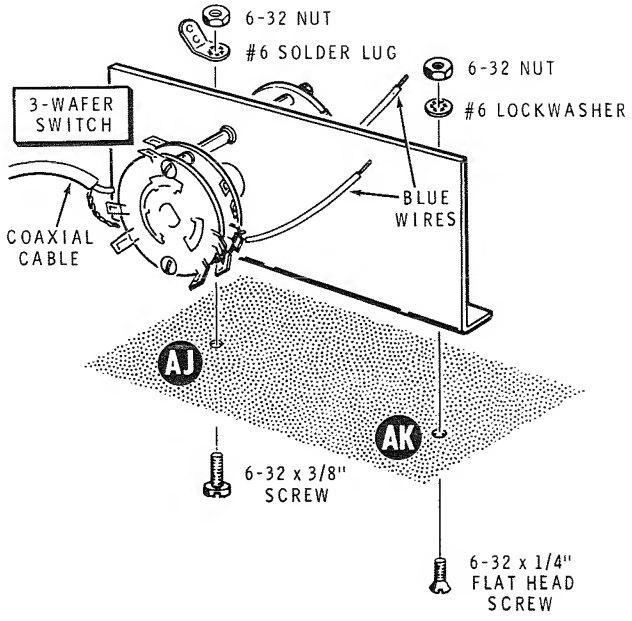
( ) Loosely mount the plug-board assembly to the front chassis with 6-32 x 3/8" hardware at AH and in the remaining six mounting holes, as shown in Detail 13-3B.

( ) Tighten the hardware in the RF shields.

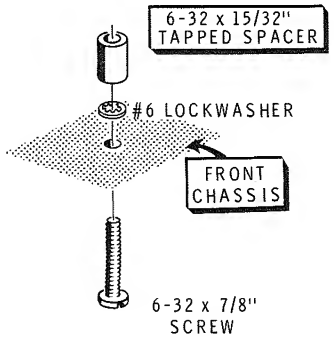
( ) Tighten the hardware at AH.

( ) Locate the previously prepared switch bracket assembly and loosely mount it to the front chassis at AK as shown in Detail 13-3C. Use a 6-32 x 3/8" screw, a #6 solder lug, and a 6-32 nut at AJ. Position the solder lug as shown. Finish mounting the switch bracket assembly with 6-32 x 1/4" hardware at the remaining mounting hole. NOTE: The hardware will be tightened later.

( ) Dress the two blue wires to the right and the coaxial cable to the left, as shown in the Detail.



Detail 13-3C



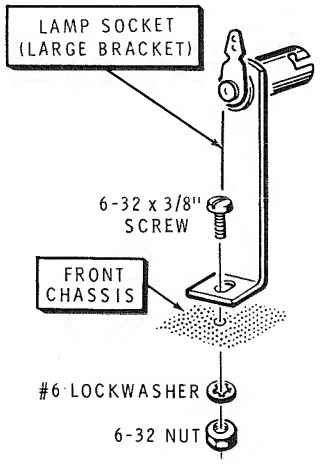
Detail 13-4A

Refer to Pictorial 13-4 (fold-out from Page 62) for the following steps.

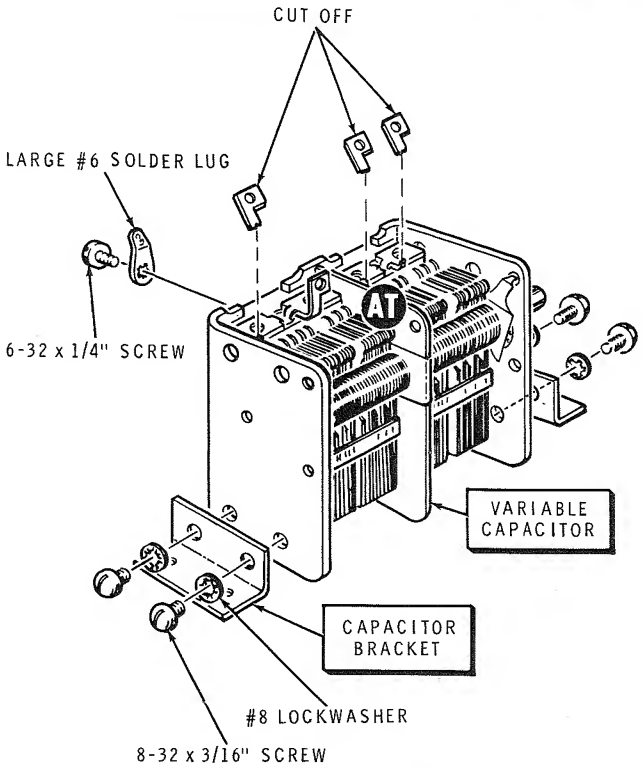
( ) Position the chassis right-side up as shown.

( ) Refer to Detail 13-4A and mount a 6-32 x 15/32" tapped spacer with a 6-32 x 7/8" screw and a #6 lockwasher at AL, AN, AP, and AR on the front chassis. The screws should extend through the spacers.

( ) Refer to Detail 13-4B and mount the lamp socket (long bracket) to the front chassis at AS with 6-32 x 3/8" hardware. Position the lamp socket as shown.



Detail 13-4B



Detail 13-4C

Refer to Detail 13-4C for the following steps.

NOTE: In the following steps, keep the plates of the variable capacitor fully meshed (closed) at all times to prevent them from being damaged.

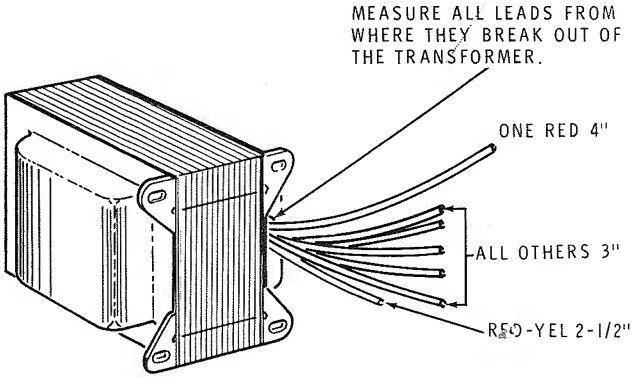
( ) Cut off the three indicated lugs of the variable capacitor (#26-74) as shown.

( ) Mount a large #6 solder lug to capacitor AT with a 6-32 x 1/4" screw. Position the solder lug as shown.

( ) Locate the two capacitor brackets. Position the brackets so the larger mounting holes are against the variable capacitor. Then mount the brackets to the capacitor with 8-32 x 3/16" screws, and #8 lockwashers.

(✓) Refer to Detail 13-4D and mount the variable capacitor to the front chassis with 4-40 x 1/4" hardware at each of the four mounting holes as shown.

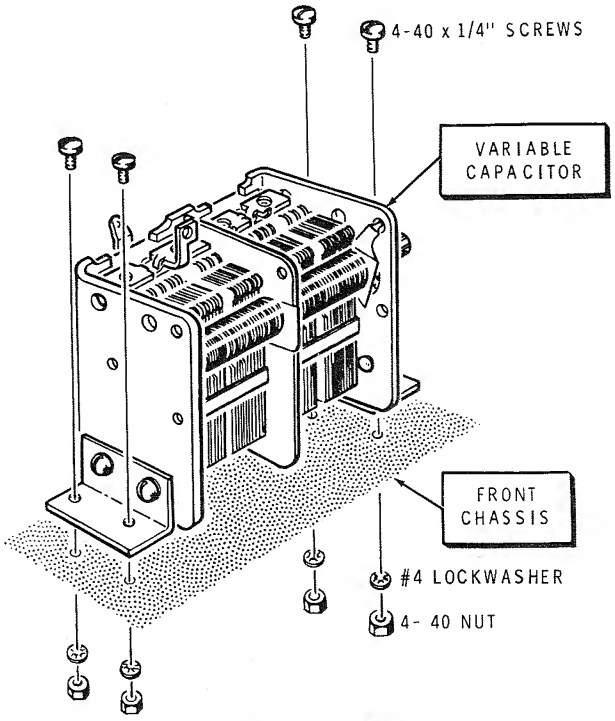
( ) Cut the leads of the power transformer (#54-242) to the indicated lengths as shown in Detail 13-4E. After the leads are cut to length, remove 1/4" of insulation from the end of each lead. Then, if necessary, melt a small amount of solder on the exposed end of each lead to hold the small wire strands together.



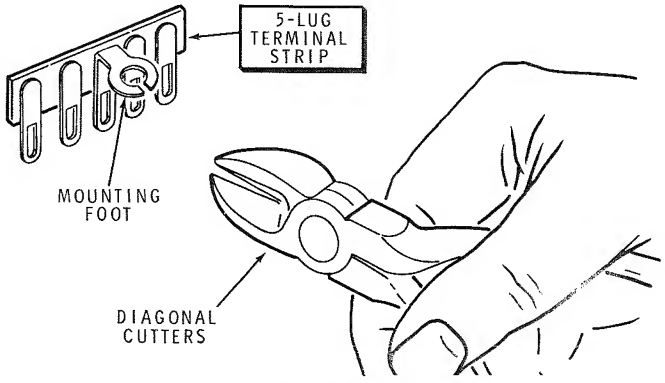
Detail 13-4E

(✓) Refer to Detail 13-4F and cut through the side of a 5-lug terminal strip mounting foot with diagonal cutters. Spread the opening to approximately 1/32".

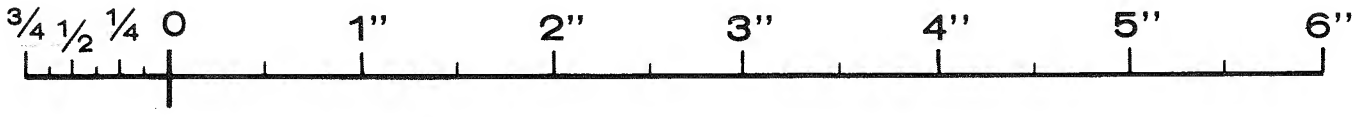
(✓) In the same manner, cut and spread the mounting foot of a 3-lug terminal strip.

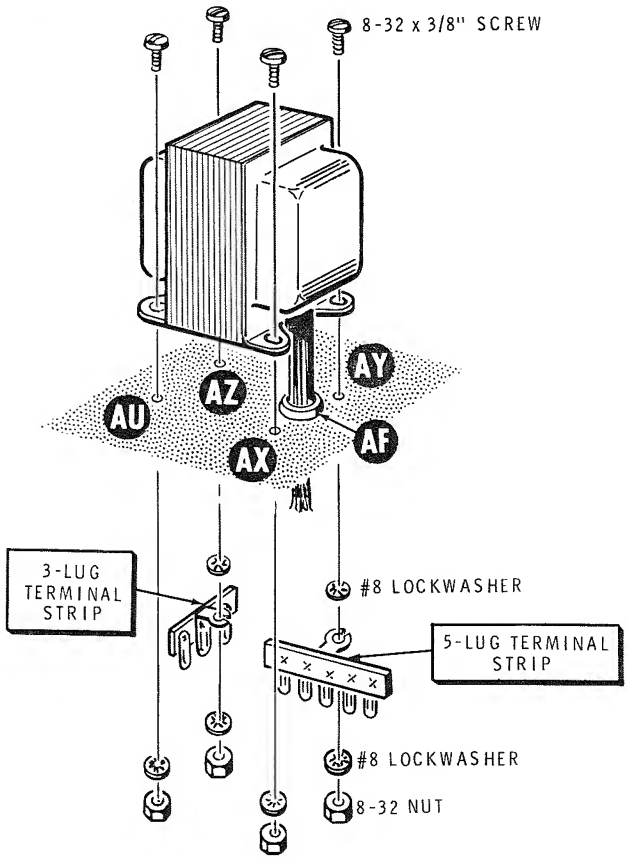


Detail 13-4D



Detail 13-4F





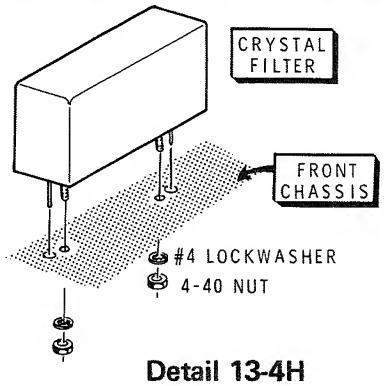
Detail 13-4G

( ) Refer to Detail 13-4G and begin mounting the power transformer by passing its leads through grommet AF. Secure the transformer to the front chassis with 8-32 x 3/8" hardware at AU and AX.

( ) Again, refer to the Detail and mount the transformer to the front chassis at AY. Use 8-32 x 3/8" hardware and a 5-lug terminal strip on the bottom of the chassis. Position the terminal strip exactly as shown.

( ) Finish mounting the transformer at AZ. Use 8-32 x 3/8" hardware and a 3-lug terminal strip on the bottom of the chassis. Position the terminal strip exactly as shown.

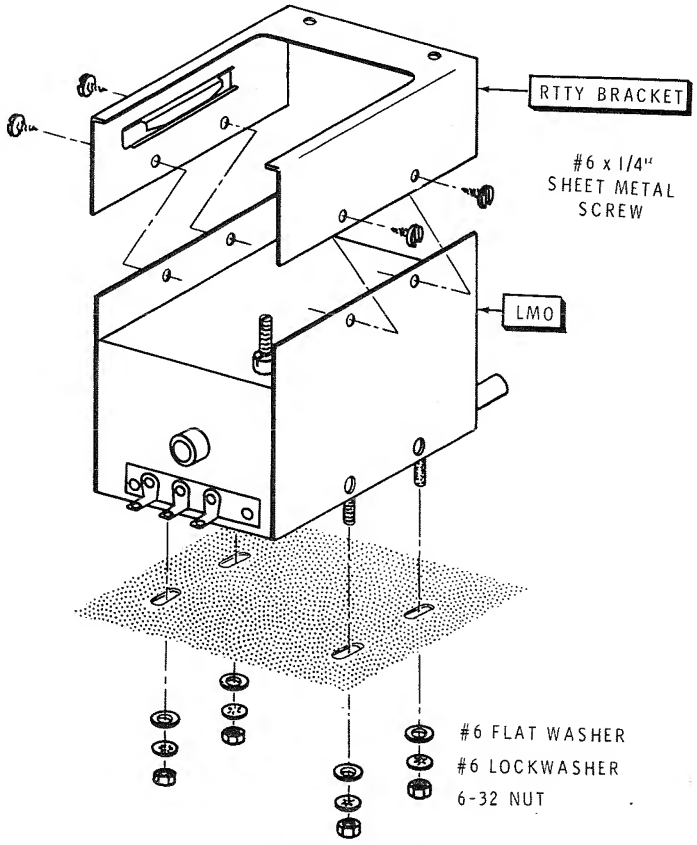
( ) Refer to Detail 13-4H and mount the 2.1 kHz SSB crystal filter (#404-283) at SB with #4 small lockwashers and 4-40 nuts.



Detail 13-4H

NOTE: If you have purchased the 3.75 kHz AM crystal filter and/or the 400 Hz CW crystal filter, install them at this time. Use the same arrangement of hardware as used for the mounting of the SSB filter. Mount each filter at the proper location on the top of the chassis. The necessary hardware is furnished with this Kit.

( ) Locate the LMO (linear master oscillator) and the RTTY bracket. Loosely mount the RTTY bracket to the LMO with four #6 x 1/4" sheet metal screws as shown in Detail 13-4J. Lift the RTTY bracket as high above the top of the LMO as the mounting screws will permit while tightening the screws.



Detail 13-4J

( ) Again, refer to the Detail and position the LMO on top of the chassis so the 6-32 spade bolts pass through the slots in the chassis as shown. Temporarily secure the LMO with #6 flat washers, #6 lockwashers, and 6-32 nuts. Position the spade bolts in the center of the slots. Tighten the nuts just enough to hold the LMO in place on the chassis.

Temporarily set the front chassis aside.

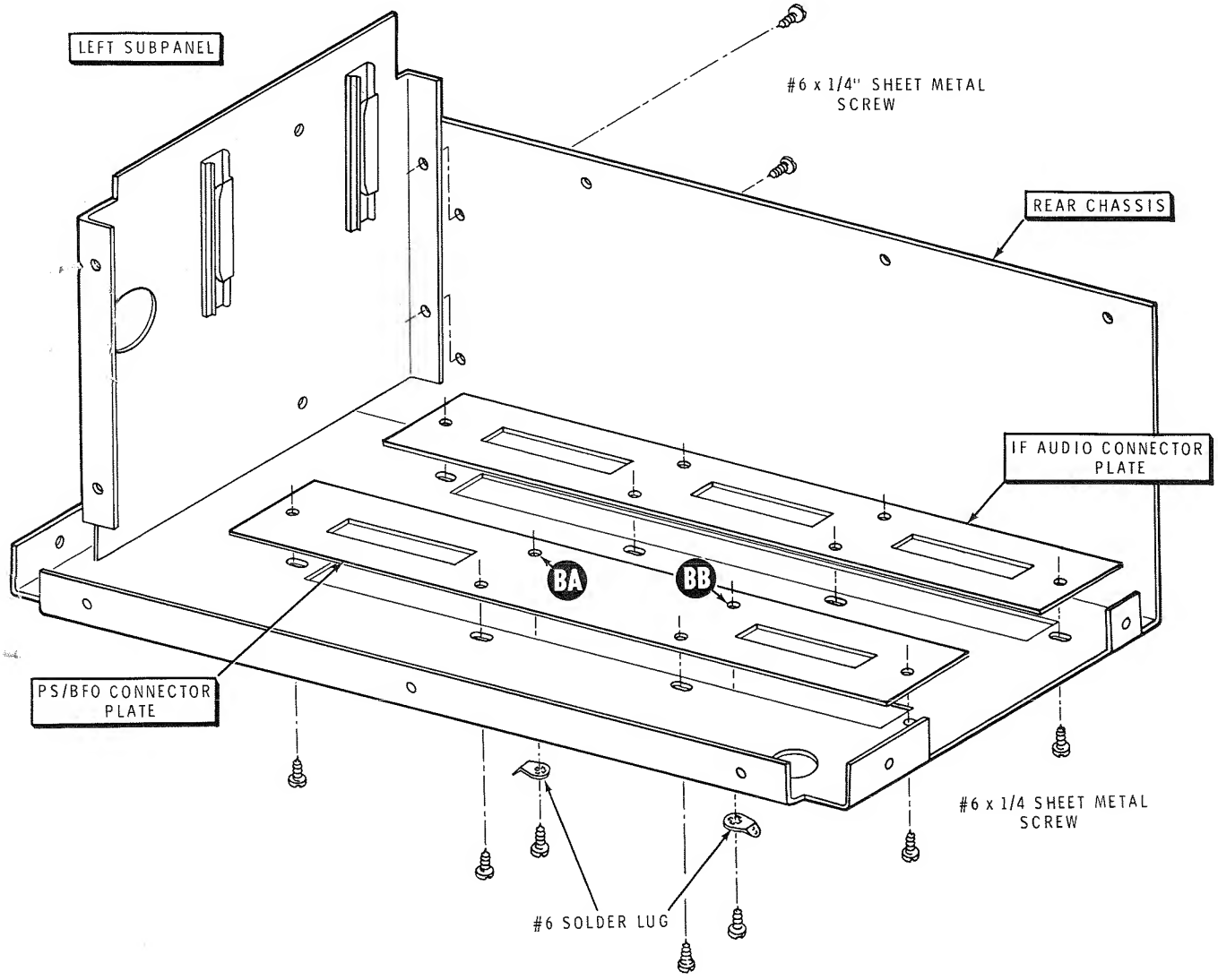
REAR CHASSIS PARTS MOUNTING AND CHASSIS ASSEMBLY

Refer to Pictorial 13-5 (fold-out from Page 73) for the following steps.

( ) Refer to Detail 13-5A and mount the IF audio connector plate to the rear chassis with six #6 x 1/4" sheet metal screws.

( ) Again refer to the Detail and mount the power supply/BFO connector plate to the rear chassis. Use #6 x 1/4" sheet metal screws and #6 solder lugs at BA and BB. Position the solder lugs as shown in the Pictorial. Finish mounting the plate with a #6 x 1/4" sheet metal screw in each of the four remaining holes.

( ) Mount the left subpanel to the rear chassis with two #6 x 1/4" sheet metal screws as shown in Detail 13-5A.



Detail 13-5A

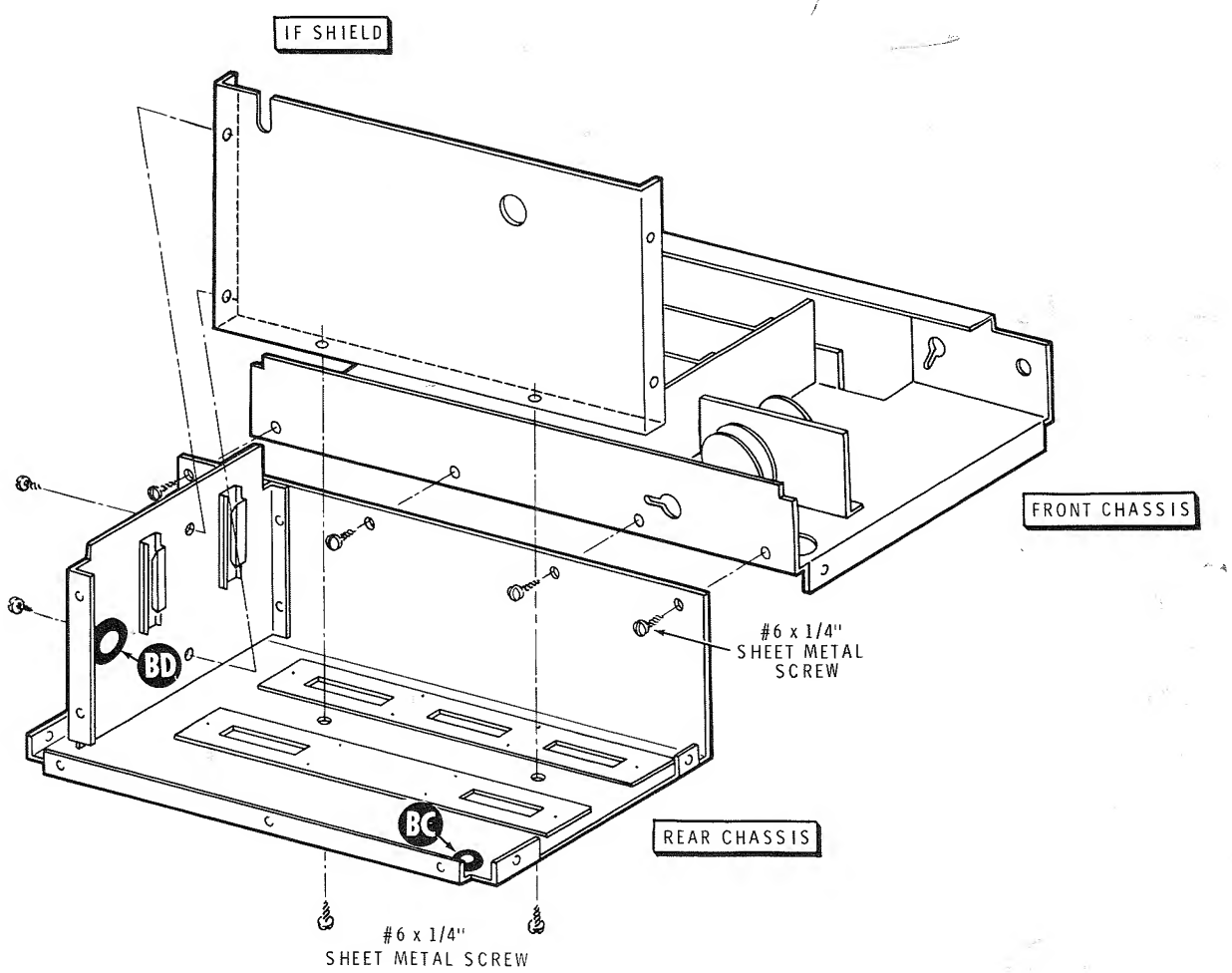
Refer to Detail 13-5B for the next four steps.

( ) Install a 1/2" rubber grommet in the rear chassis at BC as shown.

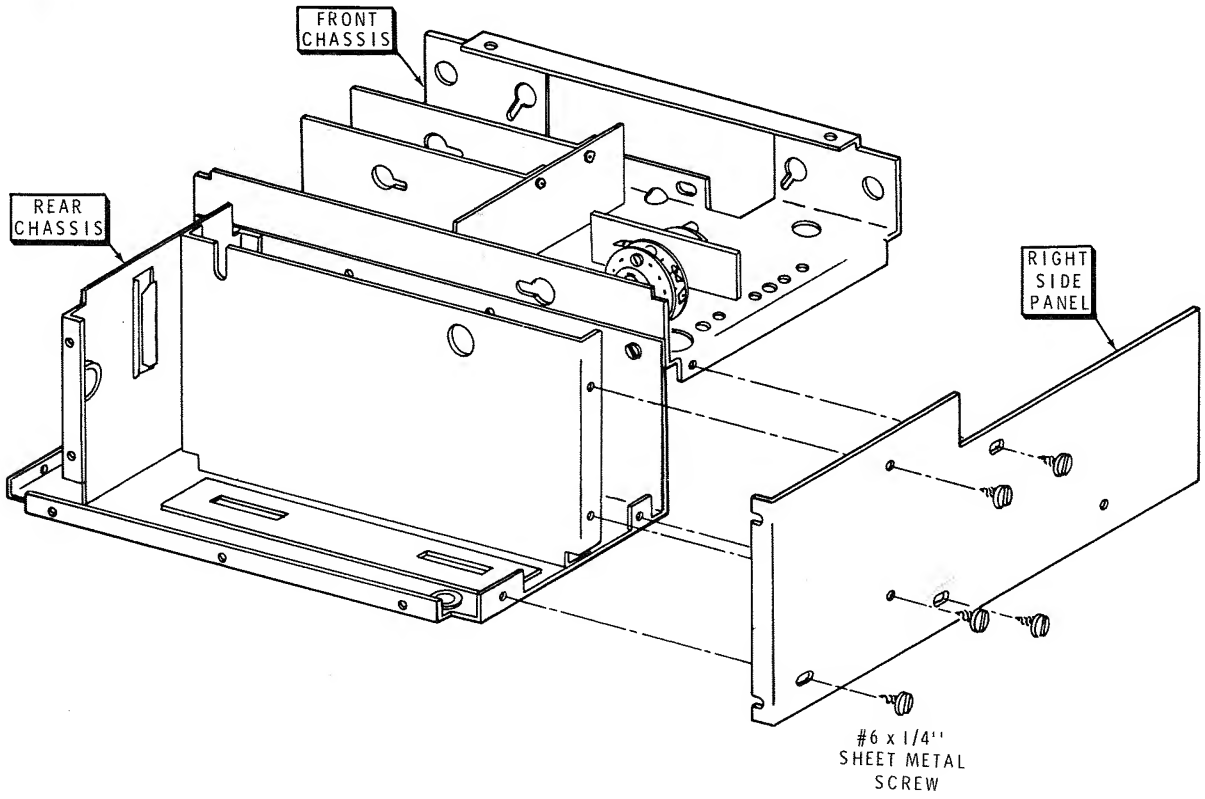
( ) In a similar manner, install a 3/4" rubber grommet in the left subpanel at BD.

( ) Mount the rear chassis to the front chassis with four #6 x 1/4" sheet metal screws.

( ) Mount the IF shield to the chassis assembly with four #6 x 1/4" sheet metal screws as shown.

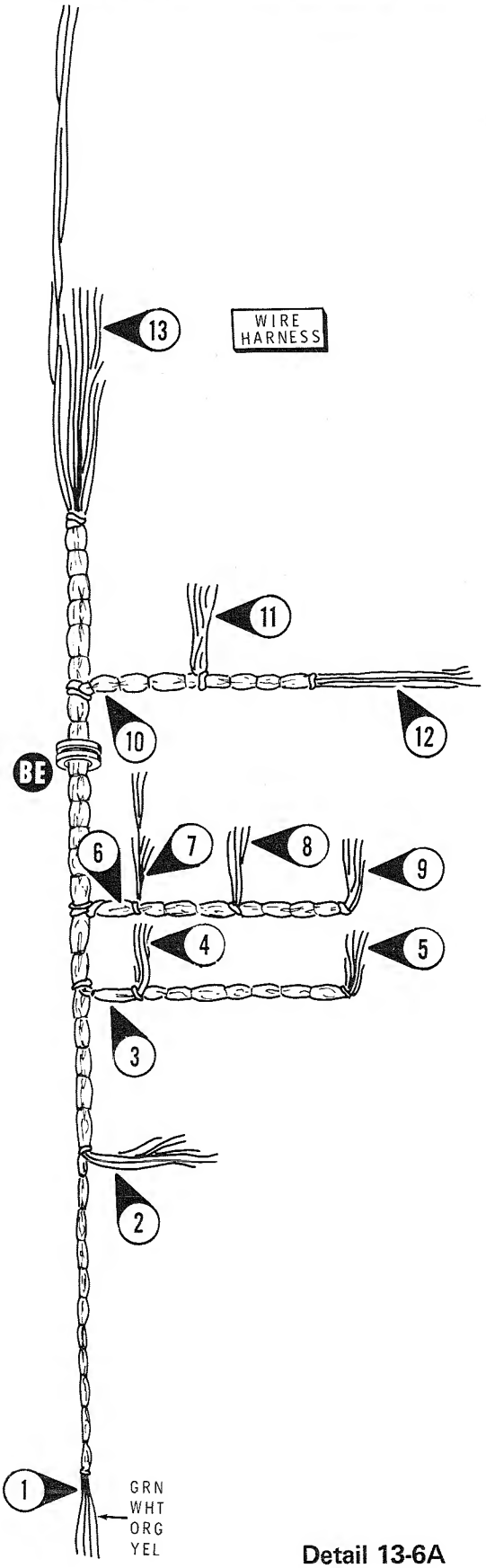


Detail 13-5B



Detail 13-5C

( ) Refer to Detail 13-5C and mount the right side panel to the chassis assembly with five #6 x 1/4" sheet metal screws. These screws may have to be loosened and retightened later during rear panel mounting.



Detail 13-6A

WIRE HARNESS INSTALLATION

Refer to Detail 13-6A for the following step.

( ) Bend the breakouts (BO) of the wire harness as shown.

( ) Locate the 3/4" rubber grommet and install it on the wire harness at BE by inserting BO#13, BO#12, BO#11, and BO#10 through it.

Refer to Pictorial 13-6 for the following steps.

( ) Position the chassis assembly as shown in the Pictorial.

( ) Position the wire harness on the chassis assembly as shown.

( ) Insert BO#1 and BO#2 of the wire harness through grommet BC.

( ) Insert BO#10, BO#11, BO#12, and BO#13 of the wire harness through the chassis hole at BE.

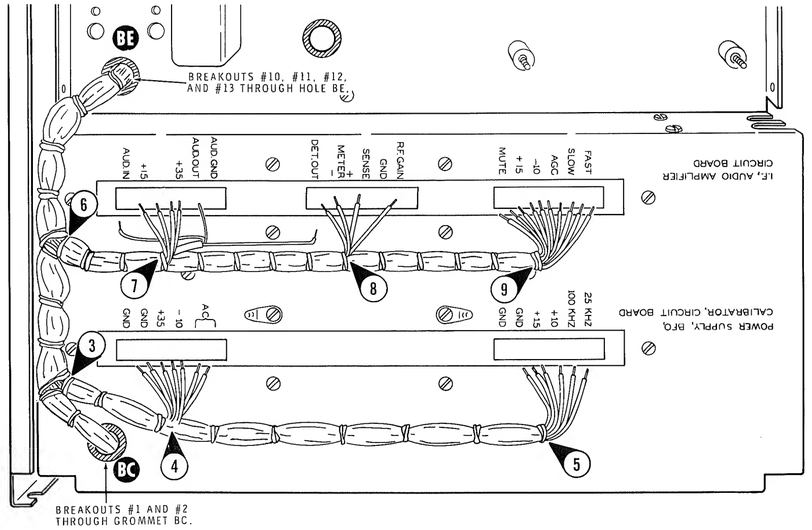
( ) Install the rubber grommet into hole BE. NOTE: It may be necessary to carefully push the grommet into position with a small screwdriver.

CAUTION: Do not push the wire harness under the edge of the right side panel. Insulation may be shaved from some of the wires which could cause a short circuit.

Refer to Pictorial 13-7 (fold-out from Page 73) for the following steps.

( ) Insert BO#12 of the wire harness through grommet AE. Then position BO#10 of the wire harness behind switch AK. The wires from BO#11 should extend away from the chassis assembly.

( ) At BO#13 of the wire harness, locate the two large red wires, two gray wires, and the cable with a red wire, black wire, and a bare wire. Bend these wires out to the side of the chassis assembly as shown.

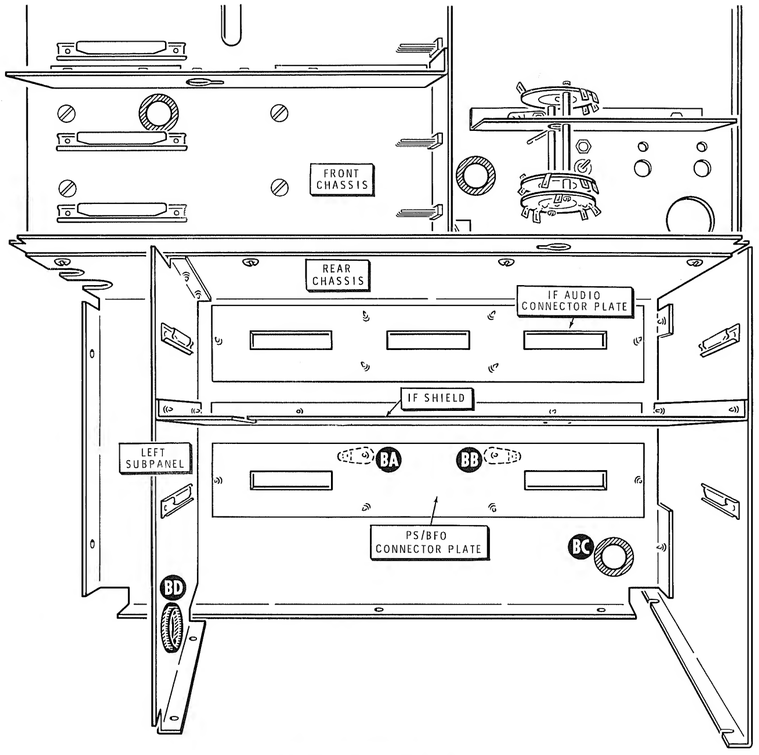


PICTORIAL 13-6

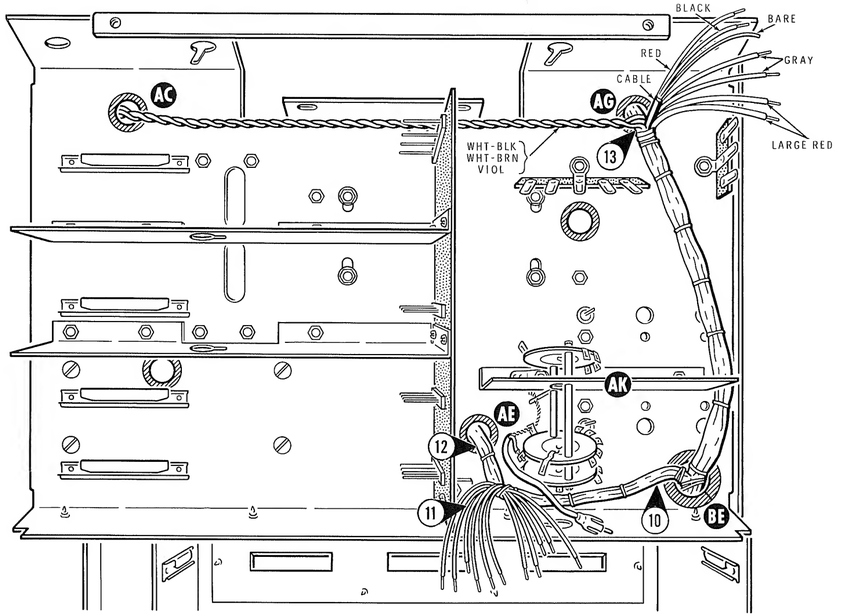
( ) Locate the long white-black wire, the long white-brown wire, and the long violet wire. Twist these wires together.

( ) Insert the remaining wires from BO#13 through grommet AG. Then position the three twisted wires along the chassis assembly and insert them through grommet AC as shown.

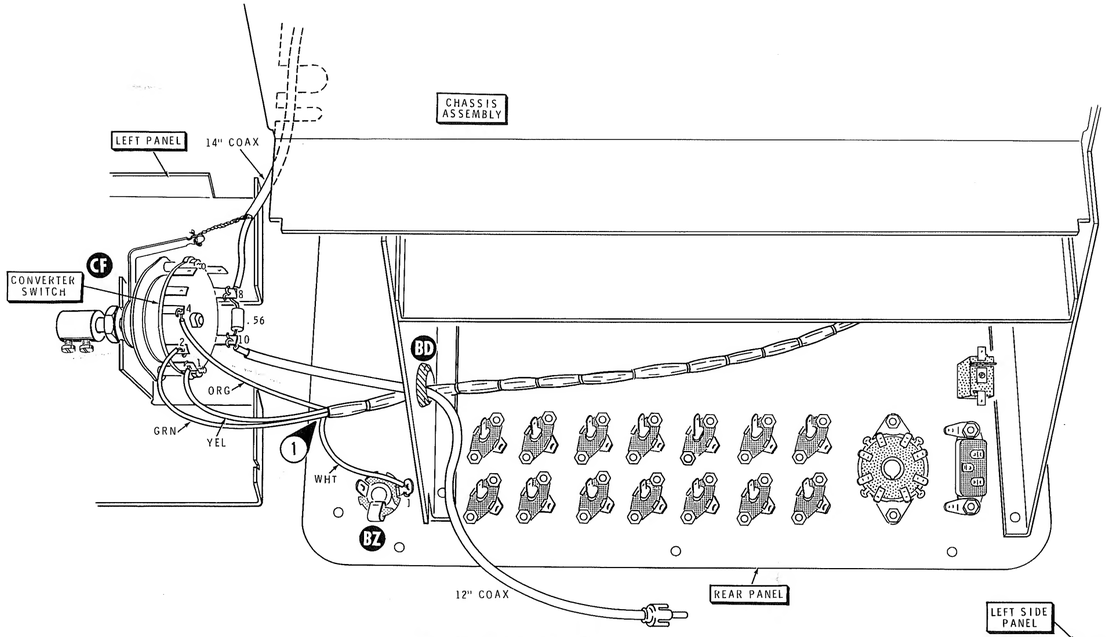
Temporarily set the chassis assembly aside.



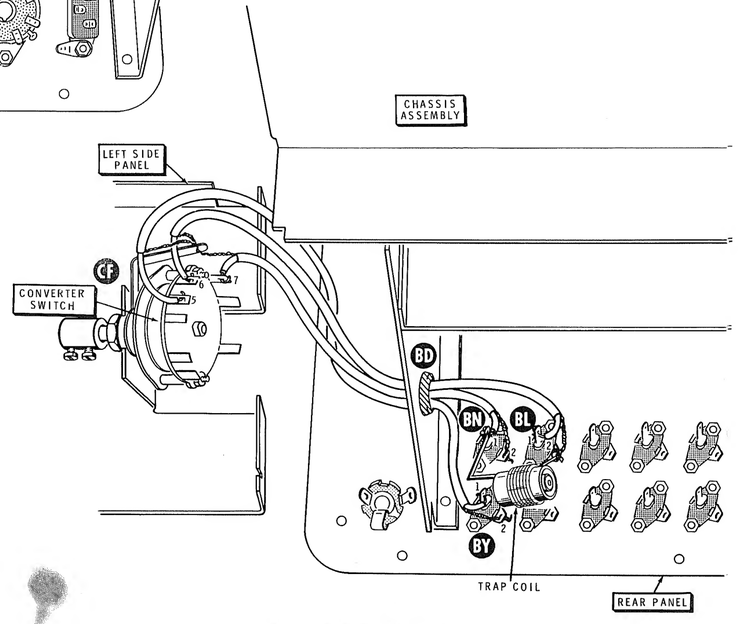
PICTORIAL 13-5



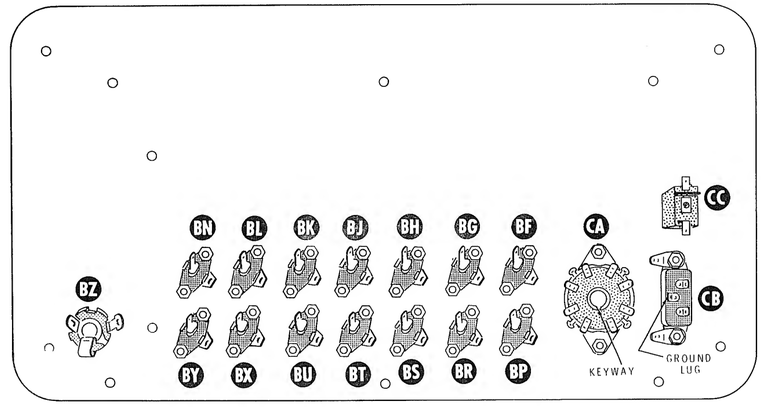
PICTORIAL 13-7



PICTORIAL 13-11



PICTORIAL 13-12



PICTORIAL 13-8

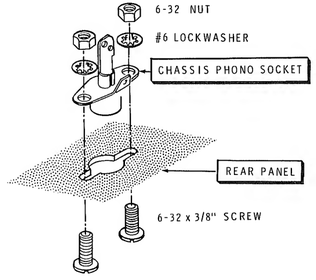
REAR AND LEFT SIDE PANEL ASSEMBLY

Rear Panel Parts Mounting

NOTE: Be sure the socket is centered before tightening the hardware in the following steps. Push a phono plug into the socket firmly; then tighten the hardware before proceeding to other sockets.

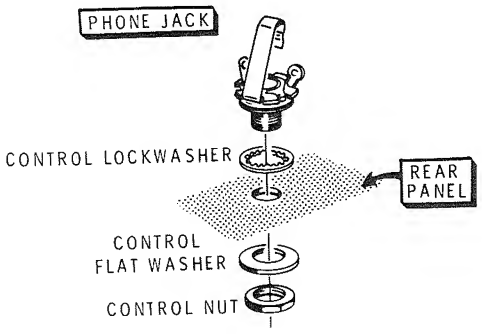
( ) Refer to Detail 13-8A and mount a chassis phono socket on the rear panel at BF. Use 6-32 x 3/8" hardware. Be sure to position the lugs of the socket as shown.

( ) In a similar manner, mount the remaining thirteen chassis phono sockets at BG through BY with the same type of hardware. Be sure to position the lugs of the sockets as shown.



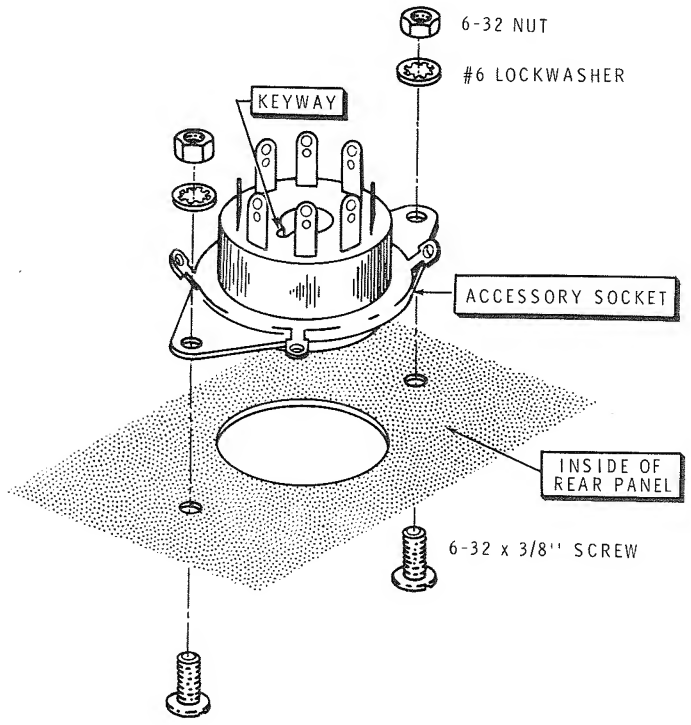
Detail 13-8A

( ) Mount the phone jack on the rear panel at BZ with a control lockwasher, a control flat washer, and a control nut as shown in Detail 13-8B.



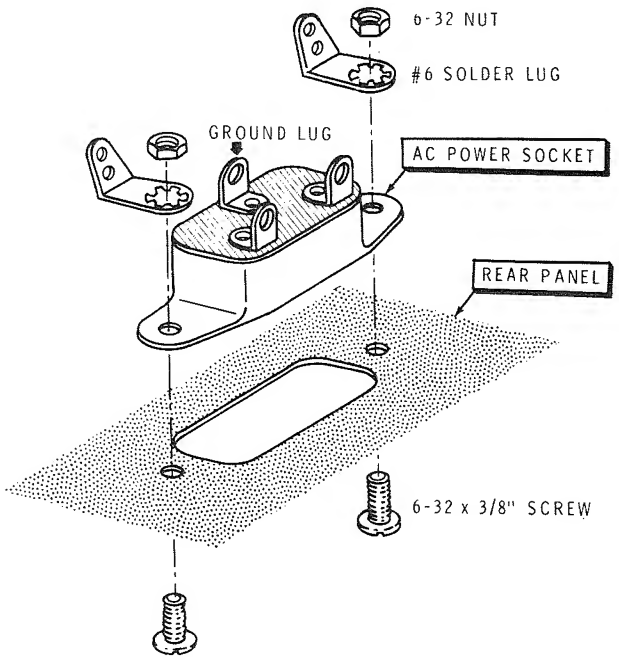
Detail 13-8B

( ) Mount the accessory socket on the rear panel at CA as shown in Detail 13-8C. Use 6-32 x 3/8" hardware. Be sure the socket keyway is positioned as shown in Pictorial 13-8.



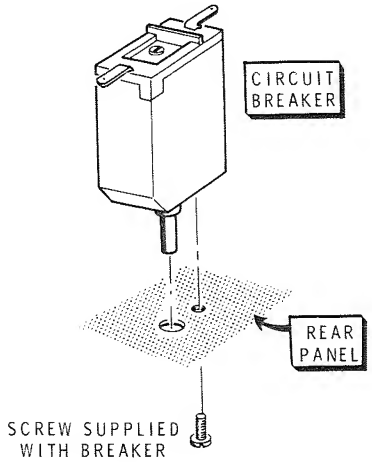
Detail 13-8C

( ) Refer to Detail 13-8D and mount the ac power socket on the rear panel at CB with 6-32 x 3/8" hardware. Be sure to position the socket ground lug and the solder lugs as shown.



Detail 13-8D

( ) Locate the circuit breaker and remove the screw that is supplied with the breaker. Refer to Detail 13-8E and mount the breaker with the supplied screw at CC on the rear panel. Be sure the breaker is seated properly. CAUTION: Do not overtighten the screw or the threads in the circuit breaker will strip.



Detail 13-8E

Rear Panel Prewiring

Refer to Pictorial 13-9 for the following steps.

( ) Position the rear panel and the chassis assembly as shown.

( ) Connect a bare wire from lug 2 (S-1) of accessory socket CA to the ground lug (S-1) on the socket as shown.

( ) Bend the wire harness extending from grommet BC so the wires from BO#2 are near the socket CA. Then insert BO#1 of the wire harness through grommet BD.

Connect the harness wires coming from BO#2 as follows:

( ) White-yellow wire to lug 1 of socket CA (S-1).

( ) Yellow wire to lug 3 of socket CA (S-1).

( ) White-black wire to lug 4 of socket CA (S-1).

( ) White-blue wire to lug 5 of socket CA (S-1).

( ) Green wire to lug 6 of socket CA (S-1).

( ) White-orange wire to lug 7 of socket CA (NS).

( ) Blue wire to lug 1 of socket BF (S-1).

( ) Violet wire to lug 1 of socket BG (S-1).

( ) Both white wires to lug 1 of socket BP (S-2).

( ) Short large red wire to lug 1 of circuit breaker CC (S-1).

( ) Long large red wire to lug 4 of socket CB (NS).

( ) Prepare a 4-1/2" blue wire. Connect one end to lug 7 of accessory socket CA (S-2). Connect the other end to lug 1 of phono socket BR (S-1).

( ) Connect one lead of a .005 μF 1.4 kV ceramic capacitor to lug 1 (S-1) and the other lead to lug 2 (NS) of socket CB.

( ) Insert one lead of a .005 μF 1.4 kV ceramic capacitor through lug 5 (S-2) to lug 3 (S-1) of socket CB. Connect the other lead to lug 4 (S-2) of socket CB.

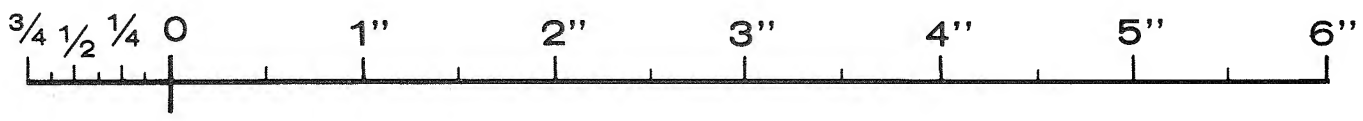
( ) Prepare a 2-1/4" length of large red wire. Connect one end of this wire to lug 2 of circuit breaker CC by bending the wire around the lug (S-1). Connect the other end of this wire to lug 2 of socket CB (S-2).

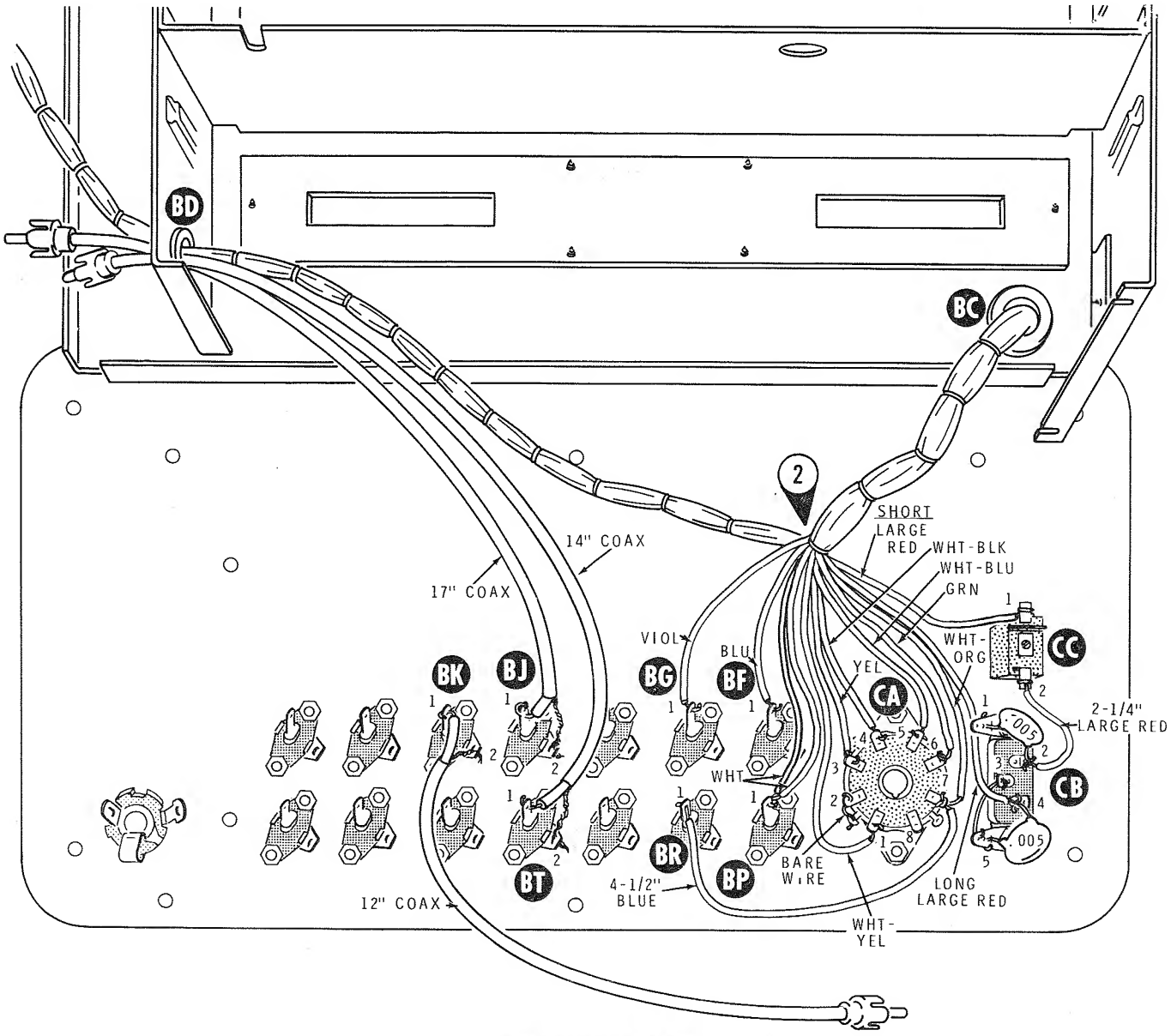
( ) Locate a previously prepared 12" length of coaxial cable with phono plug, a 14" length of coaxial cable with phono plug, and a 17" length of coaxial cable with phono plug.

( ) Connect the inner lead of the 12" cable to lug 1 (S-1) and the shield lead to lug 2 (S-1) of socket BK.

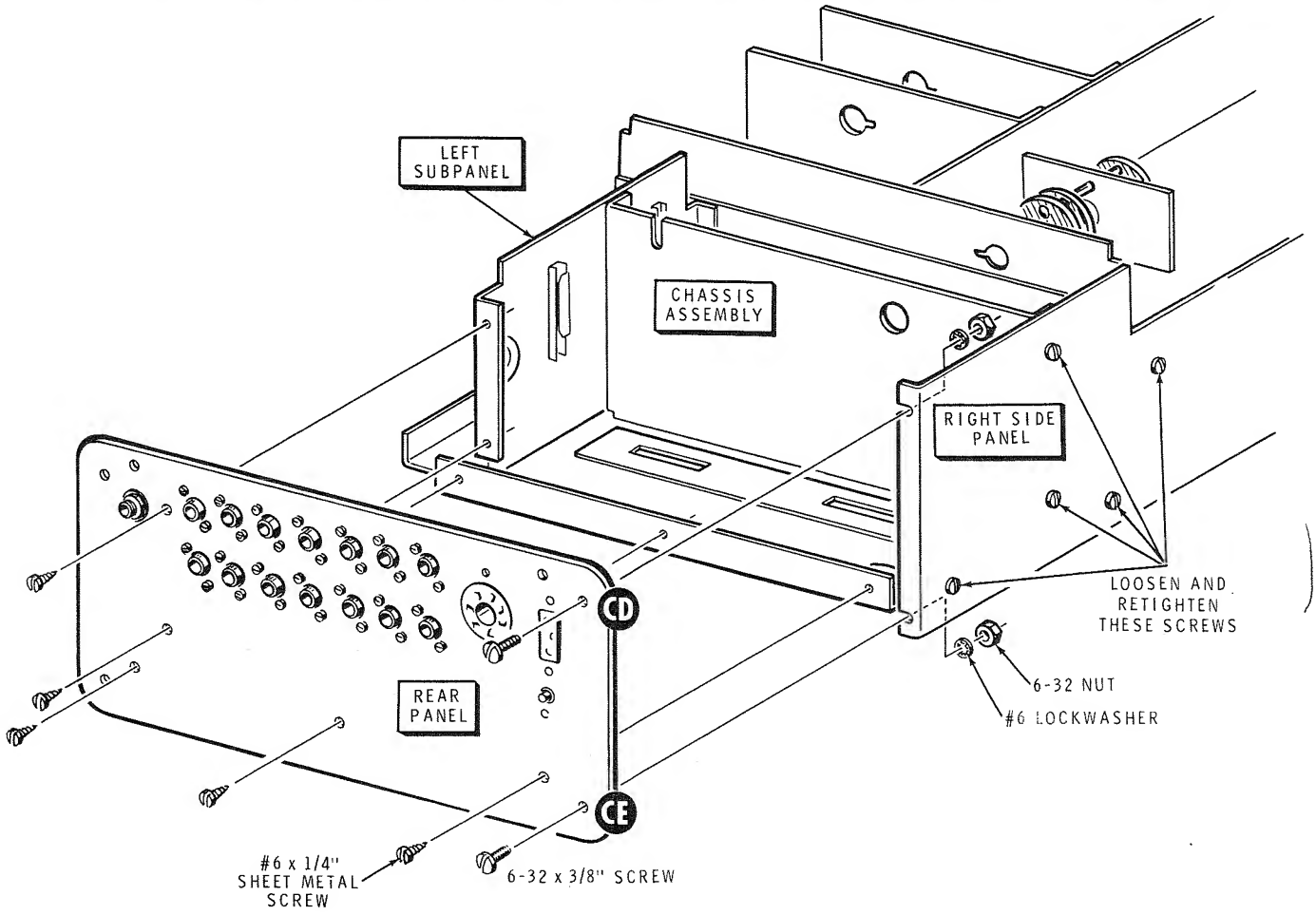
( ) Connect the inner lead of the 17" cable to lug 1 (S-1) and the shield lead to lug 2 (S-1) of socket BJ. Insert the other end of this coaxial cable through the grommet at BD.

( ) Connect the inner lead of the 14" cable to lug 1 (S-1) and the shield lead to lug 2 (S-1) of socket BT. Insert the other end of this coaxial cable through the grommet at BD.





PICTORIAL 13-9



PICTORIAL 13-10

Rear Panel Mounting

Refer to Pictorial 13-10 for the following steps.

( ) Carefully hold the rear panel up against the chassis assembly and mount it to the chassis assembly with five #6 x 1/4" sheet metal screws.

( ) Temporarily loosen the five #6 x 1/4" sheet metal screws holding the right side panel to the chassis assembly.

( ) Mount the rear panel to the right side panel with 6-32 x 3/8" hardware at CD and CE. Hold the right side panel firmly against the chassis assembly while tightening the hardware.

( ) Retighten the five #6 x 1/4" sheet metal screws in the right side panel that were loosened in a previous step.

Left Side Panel Prewiring

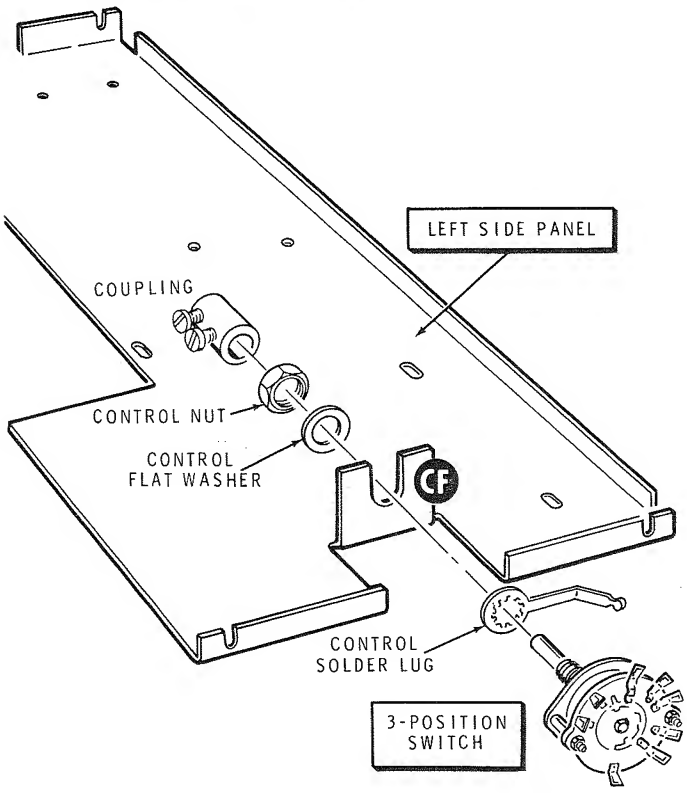
Refer to Pictorial 13-11 (fold-out from Page 74) for the following steps.

( ) Refer to Detail 13-11A and mount the 3-position switch (#63-564) on the left side panel at CF with a control solder lug, a control flat washer, and a control nut. Be sure the lugs on the switch and the control solder lug are positioned as shown.

( ) Locate a coupling and start two 6-32 x 1/4" screws in it.

( ) Again refer to Detail 13-11A and install the coupling on the shaft of switch CF. Be sure to mount the coupling with the screws positioned as shown.

( ) Connect a .56 pF phenolic capacitor from lug 8 (NS) to lug 10 (NS) of switch CF as shown in the Pictorial.



Detail 13-11A

( ) Locate a 14" length of coaxial cable without a phono plug. Connect the inner lead to lug 8 (S-2) of switch CF and the shield lead to the control solder lug (S-1).

( ) Set the chassis assembly on the rear panel as shown. Then position the left side panel near the chassis assembly.

( ) Locate a 12" length of coaxial cable with phono plug, and cut off the shield lead. Connect the inner lead to lug 10 of switch CF (S-2). Insert the plug end of this coaxial cable through grommet BD.

Connect the BO#1 harness wires coming from grommet BD as follows:

( ) White wire to lug 1 of jack BZ (S-1).

( ) Yellow wire to lug 1 of switch CF (S-1).

( ) Green wire to lug 2 of switch CF (S-1).

( ) Orange wire to lug 4 of switch CF (S-1).

Rear Panel and Left Side Panel Final Wiring

Refer to Pictorial 13-12 (fold-out from Page 74) for the following steps.

( ) Locate three 9" lengths of coaxial cable without phono plugs.

( ) At one end of one 9" coaxial cable, connect the inner lead to lug 7 (S-1) of switch CF and the shield lead to the solder lug (S-2).

( ) Insert the other end of this coaxial cable through the grommet at BD and connect the inner lead to lug 1 (NS) and the shield lead to lug 2 (S-1) of socket BN.

( ) Connect the inner lead of one end of another 9" coaxial cable to lug 6 of switch CF (S-1) and the shield lead to the solder lug (S-3).

( ) Insert the other end of this coaxial cable through the grommet at BD, and connect the inner lead to lug 1 (S-1) and the shield lead to lug 2 (NS) of socket BL.

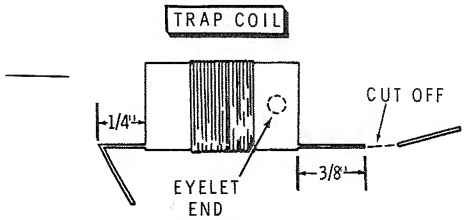
CAUTION: When preparing and installing the tuned trap in the following steps, be careful when bending the leads so the small coil wires do not break. Also, do not adjust the tuned trap. It is preset at the factory.

( ) Refer to Detail 13-12A and prepare the tuned trap (#40-546) as shown.

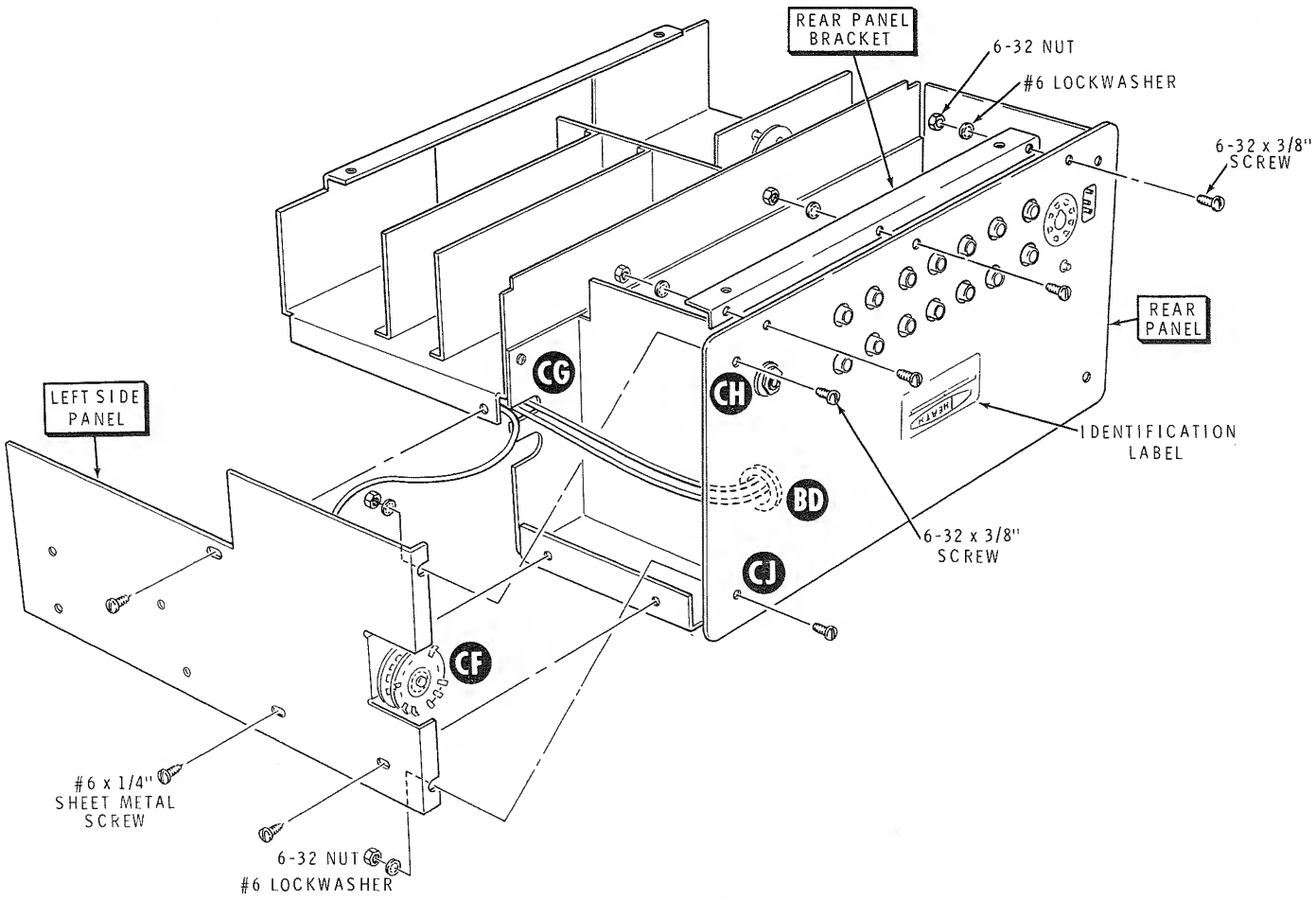
( ) Position the tuned trap between sockets BL and BN on the rear panel. Insert the 3/8" lead through lug 2 of socket BL (S-2). Press the bent lead against lug 1 of socket BN (S-2). Be sure the eyelet does not touch any sockets.

( ) Connect the inner lead of one end of the remaining 9" coaxial cable to lug 5 of switch CF (S-1) and the shield lead to the solder lug (S-4) as shown in Pictorial 13-12.

( ) Insert the other end of this coaxial cable through the grommet at BD, and connect the inner lead to lug 1 (S-1) and the shield lead to lug 2 (S-1) o f socket BY.



Detail 13-12A



PICTORIAL 13-13

Left Side Panel Mounting

Refer to Pictorial 13-13 for the following steps.

( ) Insert the two coaxial cables with phono plugs coming from grommet BD and the coaxial cable with phono plug coming from switch CF into the chassis slot at CG as shown.

NOTE: Be careful not to pinch any wires or cables when mounting the left side panel in the next steps.

( ) Carefully hold the left side panel up against the chassis assembly and mount it to the chassis assembly with three #6 x 1/4" sheet metal screws. Do not tighten the sheet metal screws.

( ) Mount the left side panel to the rear panel with 6-32 x 3/8" hardware at CH and CJ. Hold the left side panel firmly against the chassis assembly while tightening the hardware.

( ) Tighten the three #6 x 1/4" sheet metal screws holding the left side panel to the chassis assembly.

( ) Mount the rear panel bracket to the rear panel with 6-32 x 3/8" hardware at each of the three mounting holes.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the rear panel in the position shown. Be sure to refer to the numbers on the label in any communications you have with the Heath Company about this Kit.

TOP CHASSIS WIRING

Refer to Pictorial 13-14 (fold-out from Page 83) for the following steps.

( ) Position the chassis assembly as shown.

( ) Refer to Detail 13-14A and install 6-pin circuit board connectors in the chassis assembly at CK, CL, CN, CP, and CR. Cut off the nylon catch and bend the tabs on each connector before installing it. Then press the connector into the chassis assembly until the tabs lock into place.

( ) Prepare a 4" large black wire by removing 3/8" of insulation from one end and 1-1/4" of insulation from the other end. Connect the 3/8" bare wire end to the GND lug of connector CP (S-1). Insert the other end through solder lug BA (S-2) and bend it around and solder it to both GND lugs of connector CL as shown.

( ) Prepare a 3" large black wire by removing 3/8" of insulation from one end and 3/4" of insulation from the other end. Connect the 3/8" bare wire end to solder lug BB (NS), and bend the other end around and solder it to both GND lugs of connector CK as shown.

( ) Prepare a 2-1/2" large black wire by removing 1/4" of insulation from each end. Connect one end of the wire to solder lug BB (S-2) and the other end of the wire to the AUD GND lug of connector CN (NS).

Connect the wires from BO#4 of the wire harness to 6-pin connector CK as follows:

( ) Both red wires to the +35 lug (S-2).

( ) Three green wires to the -10 lug (S-3).

( ) One gray wire to either AC lug (S-1).

( ) Remaining gray wire to remaining AC lug (S-1).

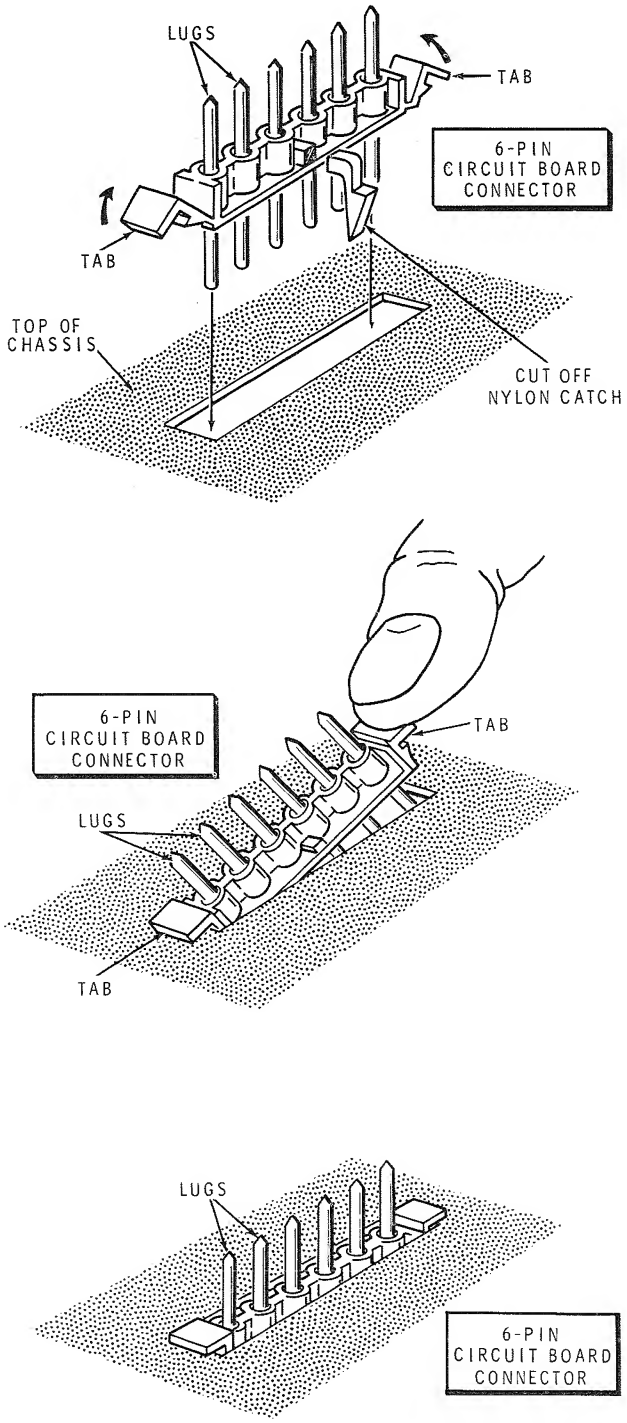
Connect the wires from BO#5 of the wire harness to 6-pin connector CL as follows:

( ) Four orange wires to the +15 lug (S-4).

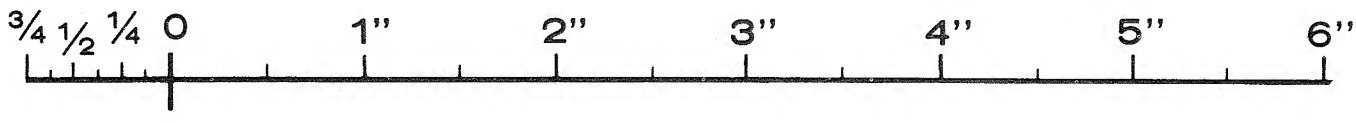
( ) Yellow wire to the +10 lug (S-1).

( ) White-brown to the 100 kHz (S-1).

( ) White-black to the 25 kHz (S-1).



Detail 13-14A



Connect the wires from BO#7 of the wire harness to 6-pin connector CN as follows:

NOTE: The red wire from the shielded cable will be connected with the wires from BO#8 of the wire harness.

( ) Black wire from the shielded cable to the AUD IN lug (S-1).

( ) Orange wire to the +15 lug (S-1).

( ) Red wire to the +35 lug (S-1).

( ) Both white wires to the AUD OUT lug (S-2).

( ) Cut 1-3/4" off of the bare wire from the shielded cable. Then connect the bare wire to the AUD GND lug (S-2).

Connect the wires from BO#8 of the wire harness to 6-pin connector CP as follows:

( ) Red wire from the shielded cable of BO#7 to the DET OUT lug (S-1).

( ) Black wire to the METER MINUS (-) lug (S-1).

( ) Red wire to the METER PLUS (+) lug (S-1).

( ) Blue wire to the SENSE lug (S-1).

( ) Yellow wire to the RF GAIN lug (S-1).

Connect the wires from BO#9 of the wire harness to 6-pin connector CR as follows:

( ) Three violet wires to the MUTE lug (S-3).

( ) Orange wire to the +15 lug (S-1).

( ) Green wire to the -10 lug (S-1).

( ) Three white-black wires to the AGC lug (S-3).

( ) White-brown wire to the SLOW lug (S-1).

( ) White-green wire to the FAST lug (S-1).

( ) Locate the previously prepared 4" coaxial cable with phono plug. Connect the inner lead to lug 1 of capacitor AT (S-1) and the shield lead to #6 solder lug AL (S-1).

( ) Temporarily remove the violet, white-brown, and white-black wires from grommet AC and then reinsert them after the next step.

( ) Insert the coaxial cable without a phono plug extending from chassis slot CG through grommet AC. Route this coaxial cable as shown.

( ) Connect the yellow wire from BO#12 of the wire harness to lug 1 of the LMO (S-1).

( ) Connect the white wire from BO#12 of the wire harness to lug 3 of the LMO (S-1).

( ) Prepare a 5" length of brown wire. Connect one end of this wire to lug 2 of the LMO (S-1). The other end of this wire will be connected later.

( ) Measure the height of slug screw CS above the top of the LMO. Record this measurement, as the slug will be moved then reset later.

( ) Use a small screwdriver and screw the slug into the LSB Adjust coil at CS until it extends approximately 3/8" above the LMO.

( ) Locate the previously prepared RTTY circuit board (#85-352-2). Position the board foil side up in the RTTY bracket, as shown, by carefully sliding it into the bracket guides. The board is temporarily installed upside down.

NOTE: When connecting wires to the foil side of a circuit board, do not push the insulation tight against the foil. Leave the insulation 1/8" away from the foil to insure a good solder connection to the foil and wire.

Connect the wires from BO#12 of the wire harness to the following holes in the RTTY circuit board. Leave the insulation 1/8" from the foil to insure a good solder connection between the foil and the wire.

( ) White-yellow wire to hole W (S-1).

( ) White-blue wire to hole N (S-1).

( ) Red wire to hole +35 (S-1).

( ) White-orange wire to hole CW (S-1).

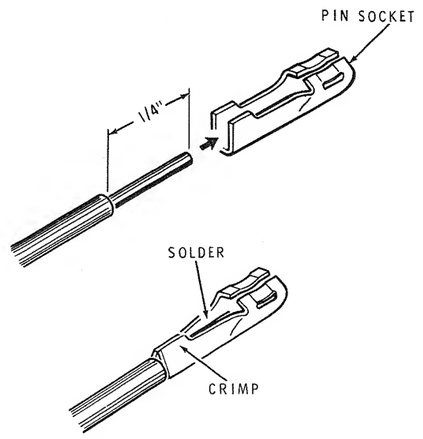
( ) Green wire to hole -10 (S-1).

( ) Connect the 5" brown wire from lug 2 of the LMO to hole FSK (S-1) on the RTTY circuit board.

( ) Pull the RTTY circuit board from the bracket guides. Then carefully turn the circuit board over and reinsert it in the bracket guides so the hole marked LSB ADJUST is centered over the LSB Adjust coil at CS.

Make sure the leads do not short together when the board is inverted.

( ) Cut the excess lead lengths from the component side of the board.



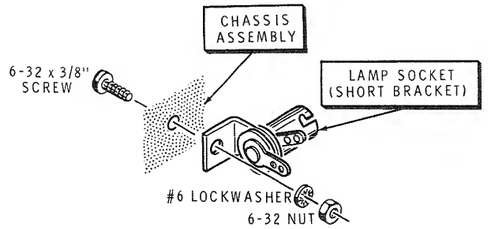
Detail 13-14B

( ) Refer to the recorded height of LMO slug CS. Turn the slug back to its original height.

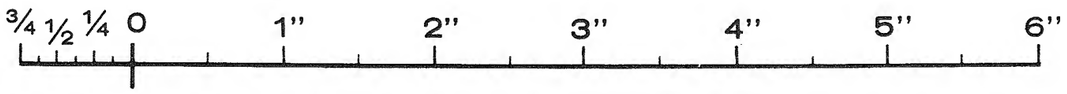
( ) Refer to Detail 13-14B and install a pin socket on the orange wire extending from BO#12 of the wire harness (S-1).

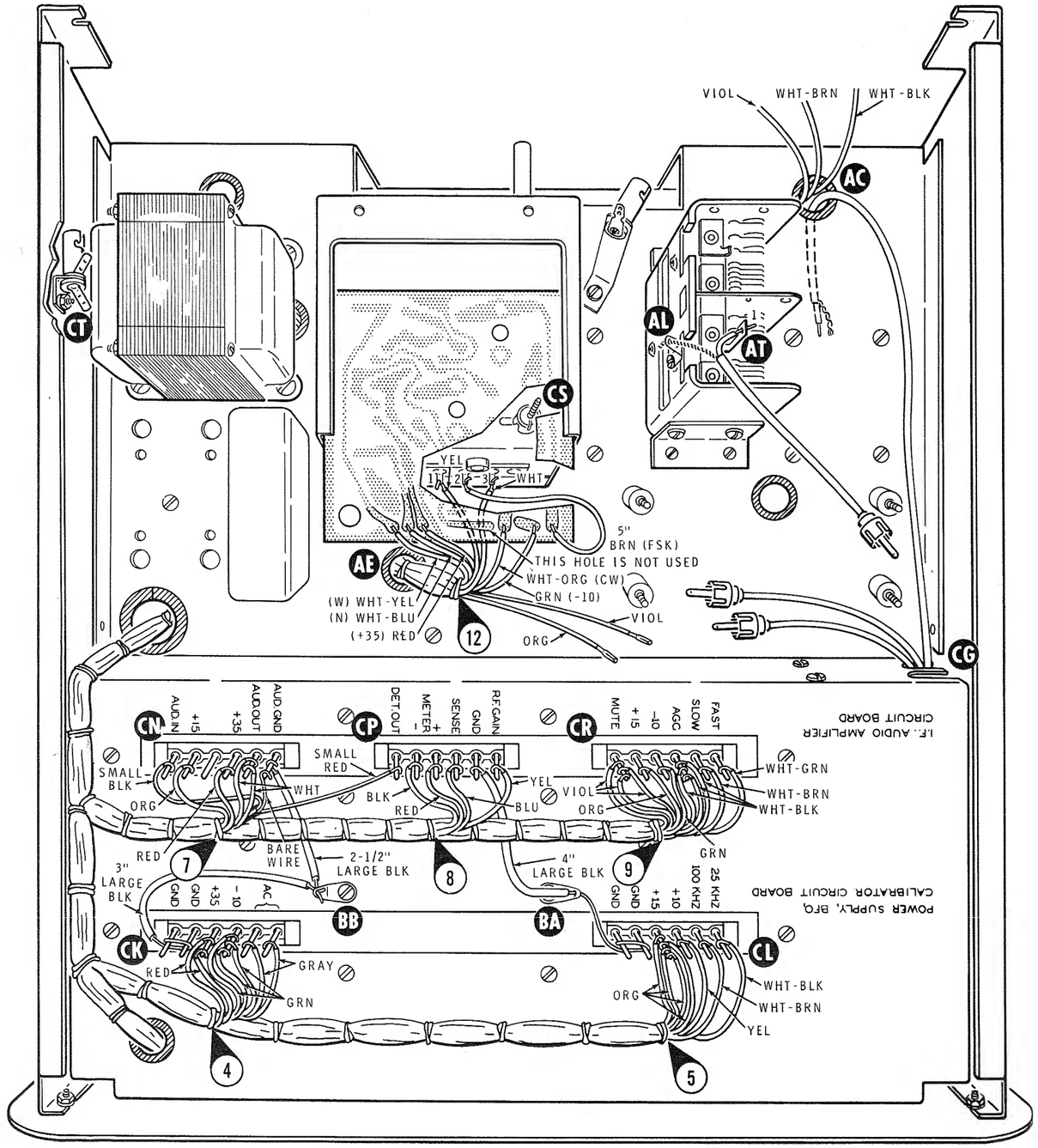
( ) In a similar manner, install a pin socket on the violet wire extending from BO#12 of the wire harness (S-1).

( ) Refer to Detail 13-14C and mount a lamp socket (short bracket) to the chassis assembly at CT with 6-32 x 3/8" hardware. Position the lamp socket as shown.

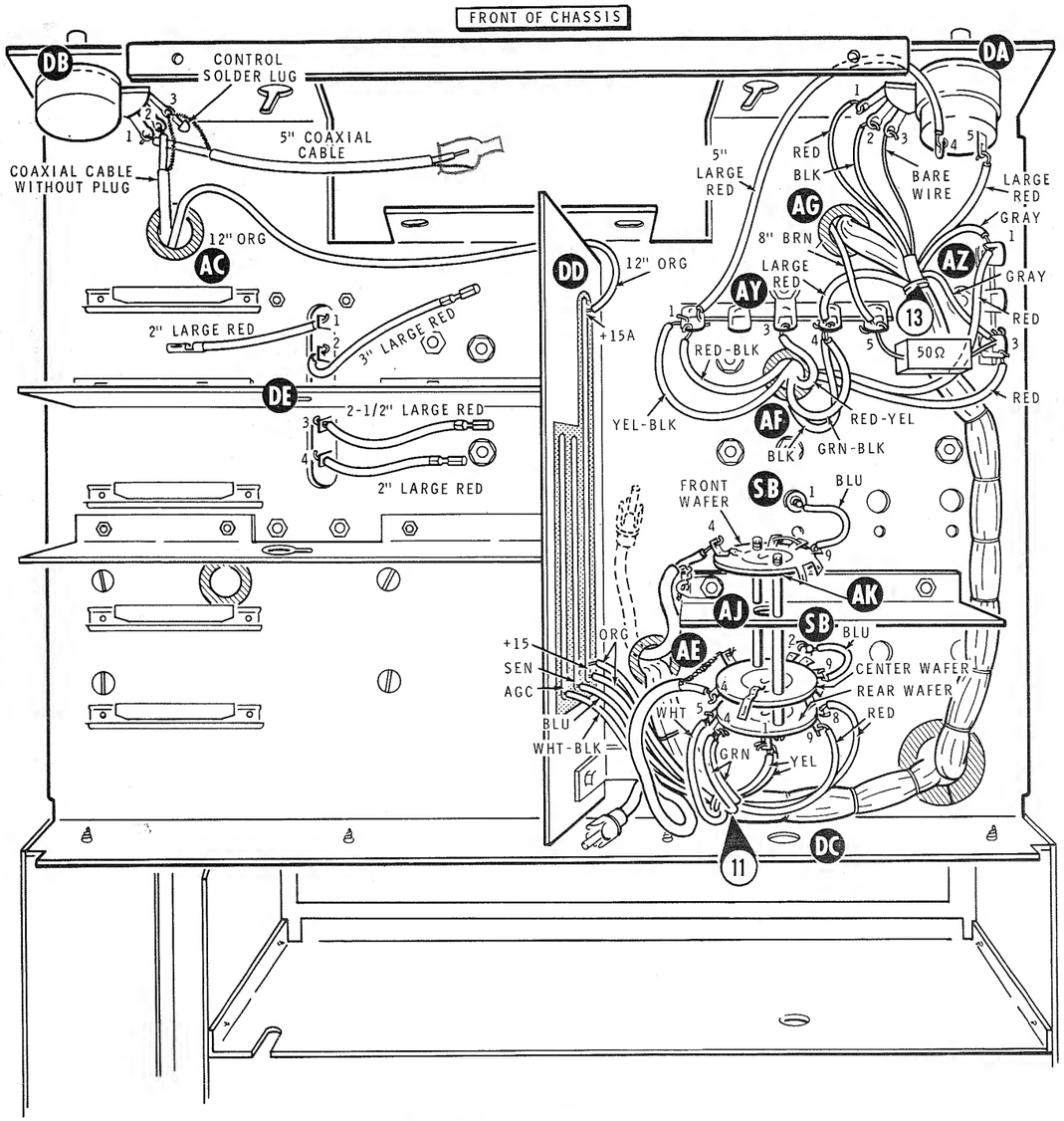


Detail 13-14C





PICTORIAL 13-14

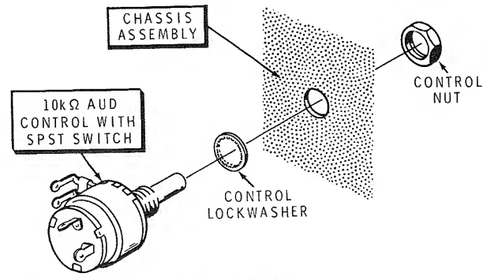


PICTORIAL 13-15

BOTTOM CHASSIS WIRING

Refer to Pictorial 13-15 for the following steps.

( ) Refer to Detail 13-15A and temporarily mount the 10 kΩ AUD (audio) control with SPST switch (#19-95) at DA with a control lockwasher, and a control nut. Position the control as shown. NOTE: The switch lugs may be positioned differently than shown.



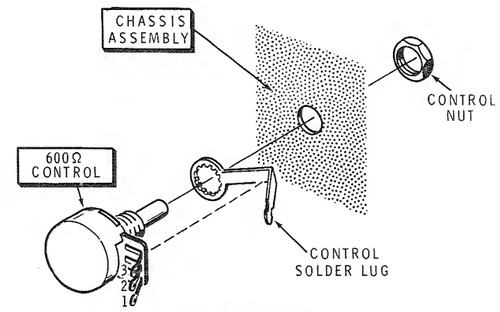
Detail 13-15A

Refer to Detail 13-15B for the following steps.

( ) Prepare the controls solder lug and control combination as follows:

1. Straighten the control solder lug.
2. Place the solder lug onto the 600 Ω (#10-34) control and lightly secure it with a control nut.
3. Bend the solder lug so it is formed upward and resting against lug 3 of the control.
4. Solder the control solder lug to lug 3 of the control.
5. Remove the control nut from the control.

( ) Temporarily mount the 600 Ω control and control solder lug combination at DB with a control nut. Position the control and solder lug as shown.



Detail 13-15B

CAUTION: When connecting wires to the crystal filter in the following steps, be sure the wires touch only the lugs they are soldered to.

( ) Connect the free end of the blue wire coming from lug 9 of the front wafer of switch AK to lug 1 of crystal filter SB (S-1).

( ) Connect the free end of the blue wire coming from lug 9 of the center wafer of switch AK to lug 2 of crystal filter SB (S-1).

NOTE: If you have the 400 Hz CW crystal filter and/or the 3.75 kHz AM crystal filter installed in the Receiver, perform the group of steps pertaining to the filter used. If neither of these filters are used, disregard the following two groups of steps.

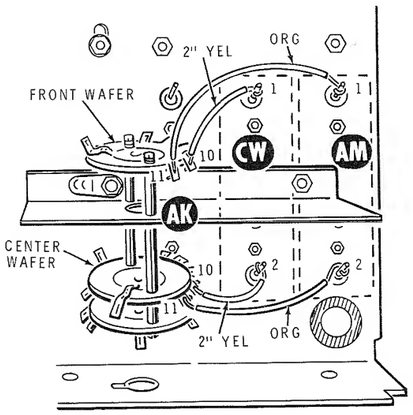
400 Hz Crystal Filter

( ) Prepare two 2" lengths of yellow wire.

Refer to Detail 13-15C for the next two steps.

( ) Connect a 2" yellow wire from lug 10 of the front wafer of switch AK (S-1) to lug 1 of crystal filter CW (S-1).

( ) Connect a 2" yellow wire from lug 10 of the center wafer of switch AK (S-1) to lug 2 of crystal filter CW (S-1).



Detail 13-15C

3.75 kHz Crystal Filter

( ) Prepare two 3" lengths of orange wire.

CAUTION: When soldering to the crystal filter lugs in the following steps, be careful not to burn or melt any insulation in the wire harness.

Refer to Detail 13-15C for the next two steps.

( ) Connect a 3" orange wire from lug 11 of the front wafer of switch AK (S-1) to lug 1 of crystal filter AM (S-1).

( ) Connect a 3" orange wire from lug 11 of the center wafer of switch AK (S-1) to lug 2 of crystal filter AM (S-1).

This completes the wiring of the crystal filters.

BOTTOM CHASSIS WIRING (Continued)

Connect the wires from BO#11 of the wire harness to the rear wafer of switch AK as follows:

( ) One red wire to lug 8 (S-1).

( ) Remaining red wire to lug 9 (S-1).

( ) White wire to lug 5 (S-1).

( ) Both green wires to lug 4 (S-2).

( ) Both yellow wires to lug 1 (S-2). NOTE: Bend these wires so they do not touch the wafer mounting screw.

Connect the wires from BO#11 of the wire harness to the holes in the plug board as follows:

( ) Both orange wires to the two +15 holes (S-2).

( ) Blue wire to the SEN hole (S-1).

( ) White-black wire to the AGC hole (S-1).

( ) Cut off the excess lead lengths from the foil side of the board.

( ) Locate the previously prepared 9" coaxial cable with phono plug. Insert the bare wire end of the coaxial cable through grommet AE from the top side of the chassis assembly. Then connect the shield lead to the #6 solder lug at AJ (S-1). Connect the inner lead of this coaxial cable to lug 4 of the front wafer of switch AK (S-1).

NOTE: In the following steps, cut off any excess wire lengths; then, remove 1/4" of insulation from each shortened wire.

Connect the wires from BO#13 of the wire harness as follows:

( ) Bare wire to lug 3 of control DA (S-1).

( ) Black wire to lug 2 of control DA (S-1).

( ) Red wire to lug 1 of control DA (S-1).

( ) One large red wire to lug 5 of control DA (S-1).

( ) Remaining large red wire to lug 4 of terminal strip AY (NS).

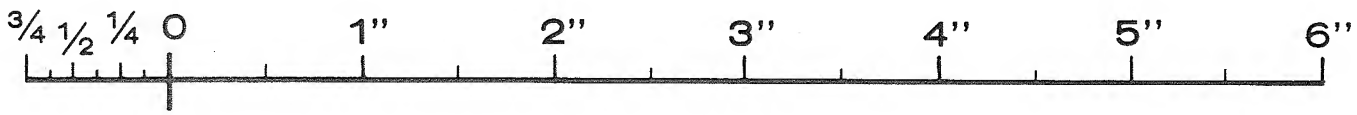
( ) One gray wire to lug 1 of terminal strip AZ (NS).

( ) Remaining gray wire to lug 3 of terminal strip AZ (NS).

( ) Prepare a 5" large red wire. Connect this wire from lug 4 of control DA (S-1) to lug 1 of terminal strip AY (NS).

( ) Prepare an 8" brown wire. Connect one end of this wire to lug 5 of terminal strip AY (NS). Insert the other end of the wire through grommet AG for connection later.

( ) Connect a 50 Ω, 5-watt resistor from lug 5 of terminal strip AY (S-2) to lug 3 of terminal strip AZ (NS). NOTE: Position the resistor 1/2" from the wire harness.



( ) Connect the long red power transformer lead from grommet AF to lug 1 of terminal strip AZ (S-2).

( ) Connect the short red power transofrmer lead from grommet AF to lug 3 of terminal strip AZ (S-3).

ALTERNATE LINE VOLTAGE WIRING

Two sets of line voltage wiring instructions are given below, one for 120 Vac line voltage and the other for 240 Vac line voltage. In the U.S.A., 120 Vac is most often used, while in many other countries 240 Vac is more common. USE ONLY THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.

120 Vac Wiring

Refer to Pictorial 13-15 (fold-out from Page 84) for the following steps.

( ) Connect the yellow-black and red-black power transformer leads from grommet AF to lug 1 of terminal strip AY (S-3).

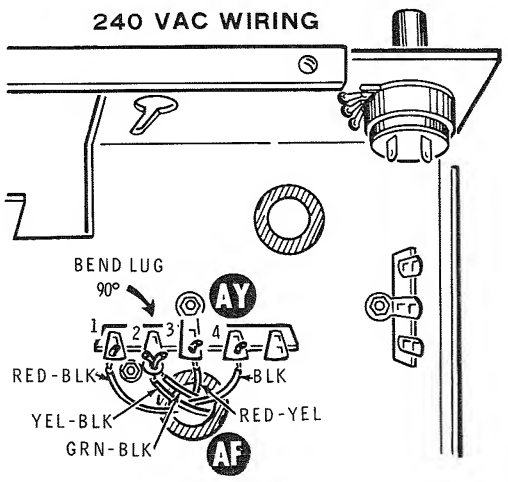
( ) Connect the red-yellow power transformer lead from grommet AF to lug 3 of terminal strip AY (S-1).

( ) Connect the black and green-black power transformer leads from grommet AF to lug 4 of terminal strip AY (S-3).

240 Vac Wiring

Refer to Detail 13-15D for the following steps.

( ) Connect the red-black power transformer lead coming from grommet AF to lug 1 of terminal strip AY (S-2).



Detail 13-15D

( ) Bend lug 2 of terminal strip AY 90 degrees, as shown in the Detail.

( ) Connect the yellow-black and green-black power transformer leads coming from grommet AF to lug 2 of terminal strip AY (S-2).

( ) Connect the red-yellow power transformer lead coming from grommet AF to lug 3 of terminal strip AY (S-1).

( ) Connect the black power transformer lead coming from grommet AF to lug 4 of terminal strip AY (S-2).

BOTTOM CHASSIS WIRING (Continued)

( ) Prepare a 12" length of small orange hookup wire.

Refer to Pictorial 13-15 for the following steps.

( ) Connect a 12" orange wire to the +15A hole at DD on the plug board (S-1), and insert the other end through grommet AC for connection later.

( ) Locate the free end of the coaxial cable, without a phono plug, coming from grommet AC.

( ) Connect the inner lead of this cable to lug 2 of control DB (S-1), and connect the shield lead to the solder lug at lug 3 of the control (NS).

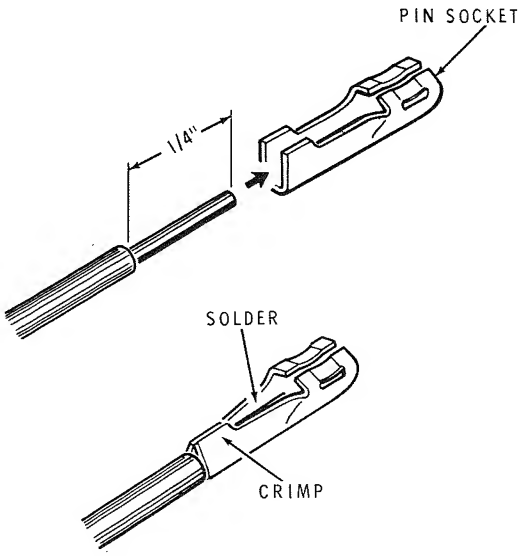
( ) Locate a 5" length of coaxial cable with phono plug.

( ) Connect the inner lead of the 5" cable to lug 1 of control DB (S-1). Connect the shield lead to the solder lug at lug 3 of the control (S-2).

( ) Prepare the following lengths of large wire. Then refer to Detail 13-15E and install a pin socket on one end of each wire.

2" red
3" red
2-1/2" red
2" red

NOTE: Connect the wire end opposite the socket in each of the following steps. The socket ends of the wires will be connected later.



Detail 13-15E

( ) Connect one end of a 2" large red wire to lug 1 of variable capacitor DE (S-1).

( ) Connect one end of a 3" large red wire to lug 2 of variable capacitor DE (S-1).

( ) Connect one end of a 2-1/2" large red wire to lug 3 of variable capacitor DE (S-1).

( ) Connect one end of a 2" large red wire to lug 4 of variable capacitor DE (S-1).

( ) Check the connections in the last four steps and be sure none of them are shorted to the chassis.

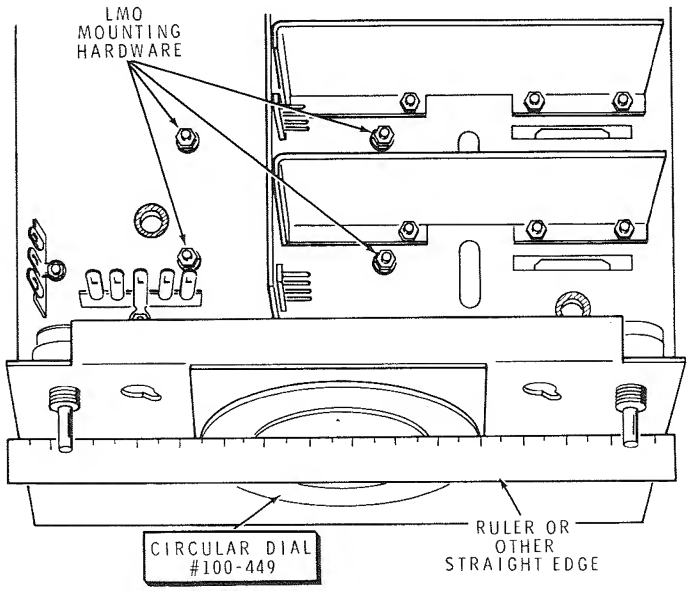
DIAL ASSEMBLY

Extra care should be taken when mounting the dial parts and the front panel. Proper installation of these parts will provide smooth operation of the main tuning.

Refer to Detail 13-16A for the following steps.

( ) Position the chassis assembly as shown in the Detail.

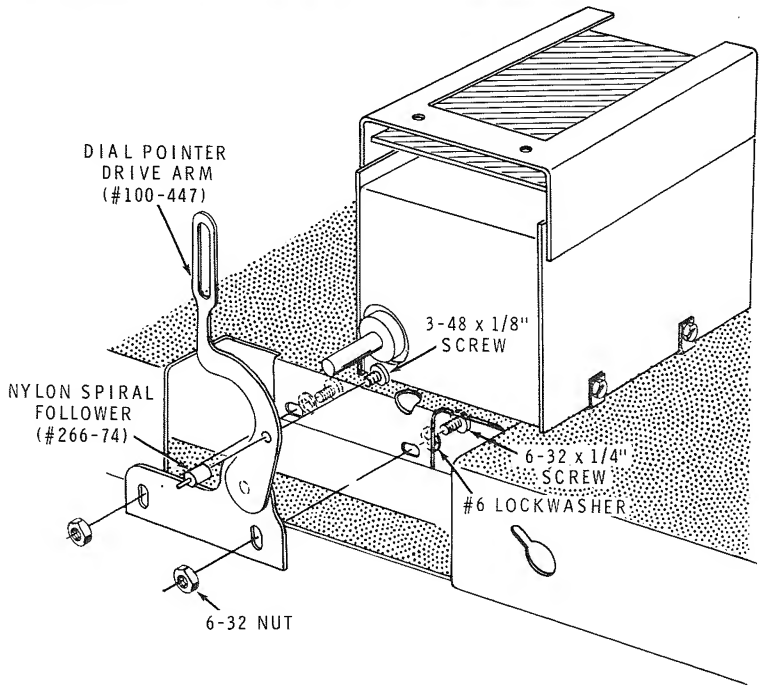
( ) Slide the circular dial (#100-449) on the shaft of the LMO.



Detail 13-16A

( ) Place a ruler or other straight edge along the front of the chassis assembly. Adjust the LMO position so the circular dial is parallel to the front edge of the chassis assembly. It may be necessary to temporarily loosen the LMO mounting hardware to correctly position the LMO. Center the LMO spade bolts in the slots, and tighten the nuts that secure the LMO to the chassis.

( ) Remove the circular dial from the LMO shaft.



Detail 13-16B

Refer to Pictorial 13-16 (fold-out from Page 93) for the following steps.

( ) Position the chassis assembly as shown in the Pictorial.

( ) Mount the nylon spiral follower (#266-74) on the pointer drive arm (#100-447) with a 3-48 x 1/8" screw, as shown in Detail 13-16B. Do not overtighten the screw as this would strip the threads in the spiral follower. NOTE: Do not grip the nylon follower with pliers.

( ) Refer to Detail 13-16B and install the dial pointer drive arm on the chassis. Use 6-32 x 1/4" hardware. Position the hardware in the center of the chassis and dial pointer arm slots. Tighten the hardware just enough to hold the dial pointer drive arm in place.

( ) Turn the shaft of the LMO fully counterclockwise against its stop.

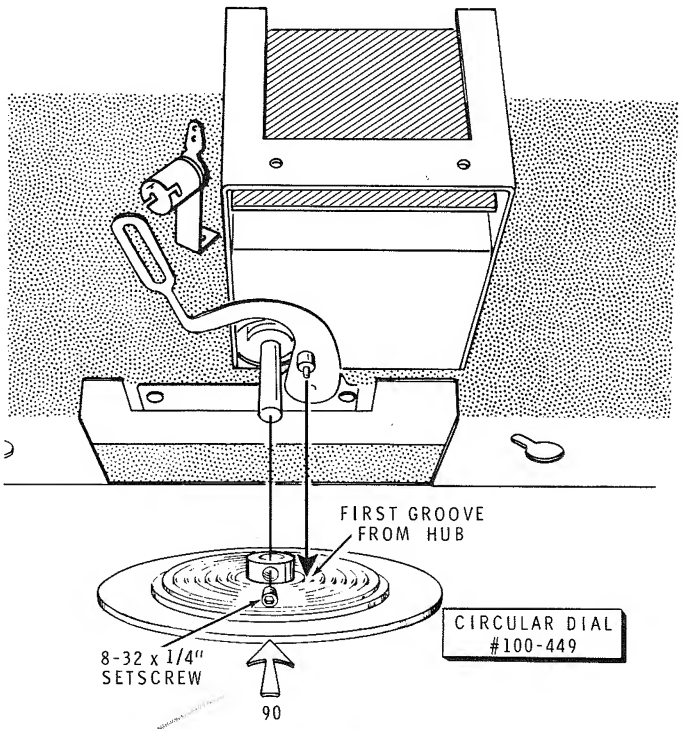
Refer to Detail 13-16C for the following steps.

( ) Start an 8-32 x 1/4" setscrew in the hub of the circular dial with the large allen wrench.

NOTE: If the nylon spiral follower will not fit into the first groove of the circular dial in the following step, loosen the hardware that secures the dial pointer drive arm to the chassis. Then, move the dial pointer arm as required. Retighten the hardware just enough to hold the dial pointer drive arm in place.

( ) Position the circular dial on the LMO shaft so the 90 marking is straight up and the nylon spiral follower is in the first groove (nearest the hub) of the circular dial.

( ) Push the circular dial onto the LMO shaft until the tip of the nylon spiral follower is to the bottom of the first groove in the circular dial; then tighten the setscrew.



Detail 13-16C

Refer to Detail 13-16D for the next two steps.

( ) Mount the plastic dial window (#464-30-1) and the dial pointer assembly (#100-443) to the dial mounting bracket (#204-553). Use a lamp socket (short bracket), a 3-48 x 3/8" flat head screw, a #3 lockwasher, and a 3-48 nut at DF. Position the lamp socket as shown. Use a 3-48 x 3/8" flat head screw, a #3 lockwasher, and a 3-48 nut in the remaining mounting hole. Bend the indicated lug of the lamp socket as shown.

( ) Install a #47 pilot lamp and a pilot lamp shield in the socket just mounted at DF. Position the shield as shown.

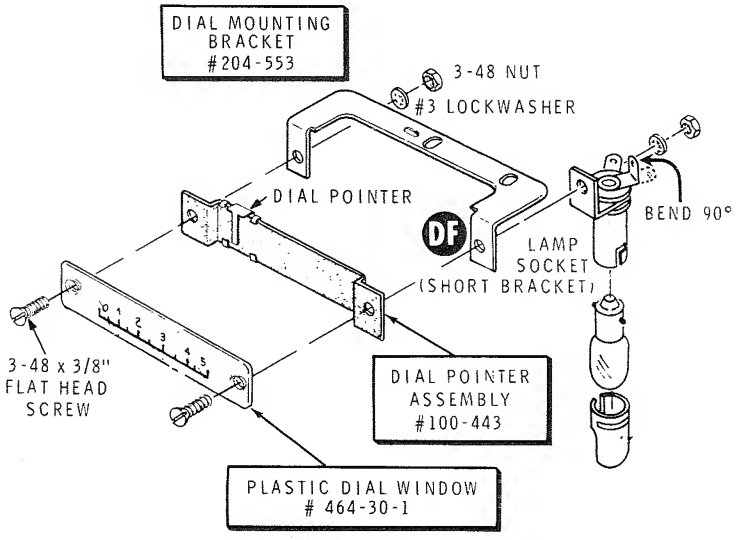
( ) Install two 6-32 speednuts on the top-front of the RTTY bracket. Position the curved side down.

NOTE: If the stud from the rear of the dial pointer will not fit into the the slot in the dial pointer drive arm in the following step, loosen the mounting hardware of the dial pointer drive arm and move it as required.

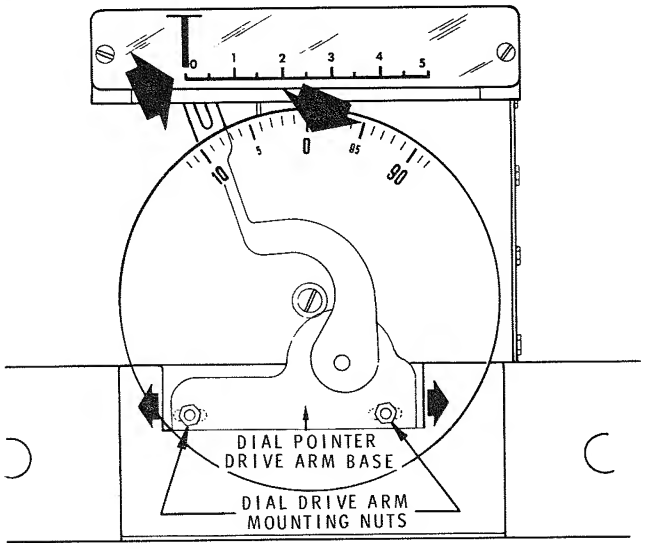
( ) Mount the dial-mounting bracket to the RTTY bracket with two 6-32 x 3/8" screws. Position the stud from the rear of the dial pointer into the slot of the dial pointer drive arm.

( ) Check to see that the front of the plastic dial window is flush with the zero set dial on the circular dial as shown in the inset drawing on Pictorial 13-16. If not, loosen the two screws on the top of the RTTY bracket and adjust the dial-mounting bracket as required. Retighten the screws.

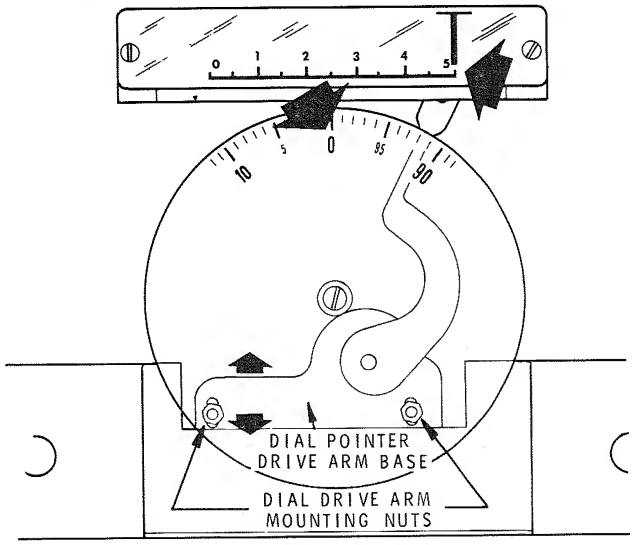
NOTE: If the zero set dial does not rotate freely under the plastic dial window, bend the dial-mounting bracket up to obtain sufficient clearance.



Detail 13-16D



Detail 13-16E



Detail 13-16F

Refer to Detail 13-16E for the following steps.

( ) Rotate the circular dial clockwise from the fully counterclockwise position (90 marking) to the first zero marking. The dial pointer should be at the zero marking on the plastic dial window. If not, perform one of the following two steps.

( ) 1. If the dial pointer is to the right of the zero marking, loosen the dial pointer drive arm mounting nuts with the 1/4" wrench, and move the dial pointer drive arm base to the right until the dial pointer is at zero. Do not move the dial pointer drive arm base up or down. Retighten the nuts.

( ) 2. If the dial pointer is to the left of the zero marking, loosen the dial pointer drive arm mounting nuts with the 1/4" wrench, and move the dial pointer drive arm base to the left until the dial pointer is at zero. Do not move the dial pointer drive arm base up or down. Retighten the nuts.

Refer to Detail 13-16F for the following steps.

( ) Rotate the circular dial in a clockwise direction; one revolution (zero to zero) should move the dial pointer to the 1 marking on the plastic dial window. Each time the circular dial is rotated one revolution clockwise, the dial pointer should advance one more number on the plastic dial window. After five complete revolutions, the dial pointer should be very close to the 5 marking on the plastic dial window. If not, perform one of the following steps.

( ) 1. If the dial pointer is to the left of the 5 marking, loosen the dial pointer drive arm mounting nuts with the 1/4" wrench, and move the dial pointer drive arm base up until the dial pointer is at the 5 marking. Do not move the dial pointer drive arm base to the left or right. Tighten the nuts.

( ) 2. If the dial pointer is to the right of the 5 marking, loosen the dial pointer drive arm mounting nuts with the 1/4" wrench, and move the dial pointer drive arm base down until the pointer is at the 5 marking. Do not move the dial pointer drive arm base to the left or right. Tighten the nuts.

This adjustment may affect the dial pointer setting at the zero marking. Repeat the entire procedure as many times as necessary to obtain proper dial and pointer calibration. The dial pointer need not be exactly at a number when the circular dial is at one of its five possible zero settings; however, following the preceding steps should permit fairly close calibration. Rotating the circular dial from the fully counterclockwise position to the fully clockwise position will cause the dial pointer to go to the left of the zero marking and to the right of the 5 marking on the plastic dial window.

( ) Check the mechanical operation of the drive assembly by rotating the circular dial until the LMO shaft hits its fully clockwise stop. At this position the dial plate should have rotated five full turns plus enough to have the dial read approximately 10. The operation should be smooth with no binding or rubbing of the drive pawl in the circular dial groove. If there is any binding, loosen the setscrew in the hub of the circular dial plate and move it out toward the end of the LMO shaft a very small amount to relieve any binding and retighten the setscrew.

Set the chassis assembly aside until it is called for.

FRONT PANEL PARTS MOUNTING AND WIRING

Refer to Pictorial 13-17 (fold-out from Page 93) for the following steps.

( ) Place a soft cloth over your work area to protect the finish on the front panel in the following steps.

( ) Position the front panel lettered side down as shown.

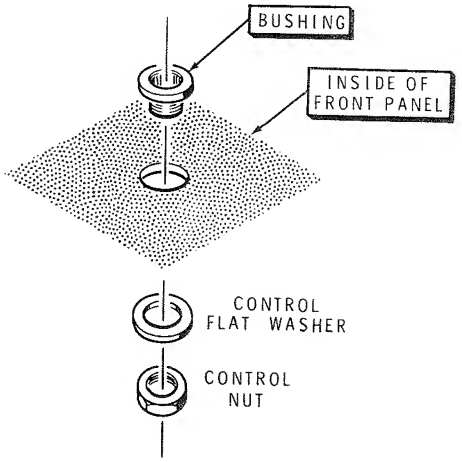
NOTE: In the following step, it may be necessary to sand or file off any excess paint or material from the top inside edge of the front panel to allow the escutcheon to be installed.

( ) Install the dial escutcheon (#446-40). Be sure that the tabs at the top of the escutcheon fit behind the front panel. Push the escutcheon as far as possible to the top of the front panel.

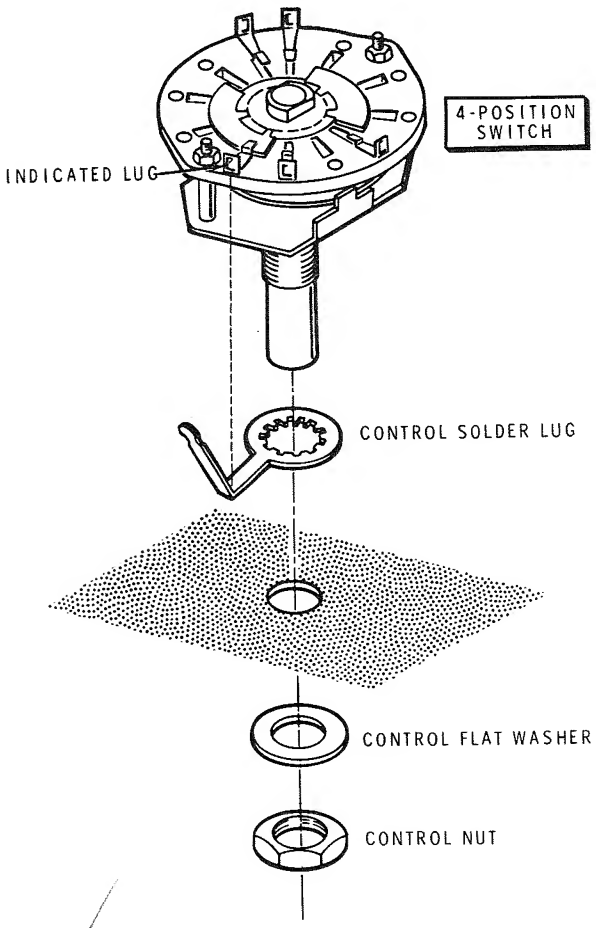
( ) Mount the drive shaft bushing at DG as shown in the inset drawing. Be sure the bushing is inserted from the inside of the front panel. Tighten the nut only finger tight at this time.

( ) Refer to Detail 13-17A and mount a bushing at DH on the front panel with a control flat washer and a control nut. Tighten the nut only finger tight.

( ) Again refer to the Detail and mount a bushing at DJ on the front panel with a control flat washer and a control nut. Tighten the nut only finger tight.

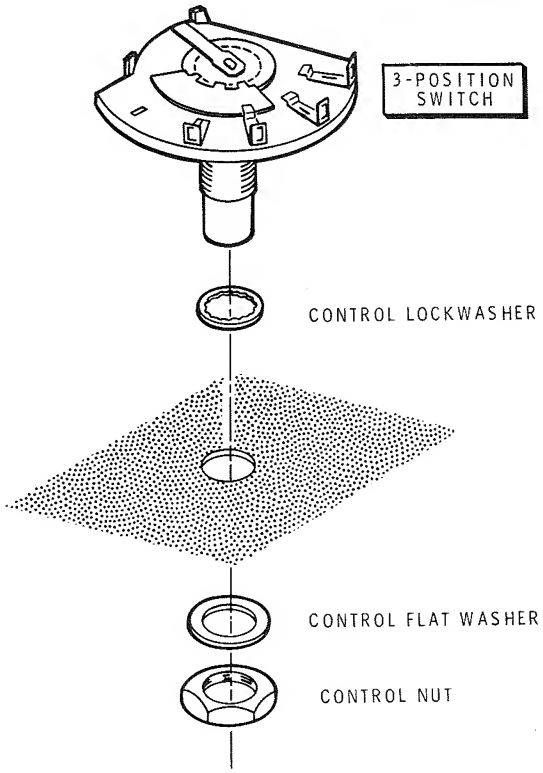


Detail 13-17A



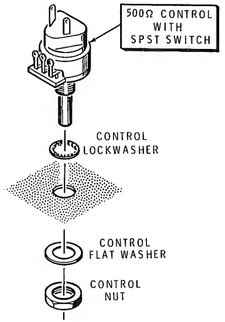
Detail 13-17B

( ) Mount a 4-position switch (#63-563) on the front panel at DK with a control solder lug, a control flat washer, and a control nut as shown in Detail 13-17B. Position the control solder lug so it lines up with the indicated switch lug. Tighten the nut securely.

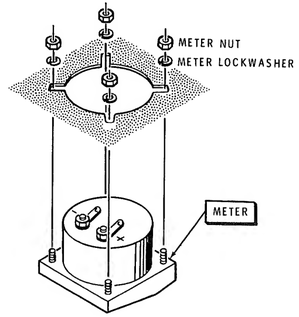


Detail 13-17C

( ) Mount a 3-position switch (#63-572) on the front panel at DL as shown in Detail 13-17C with a control lockwasher, a control flat washer, and a control nut. Position the switch as shown.



Detail 13-17D

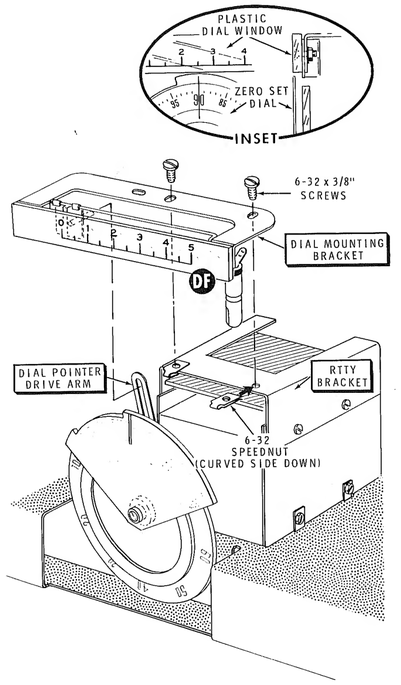


Detail 13-17E

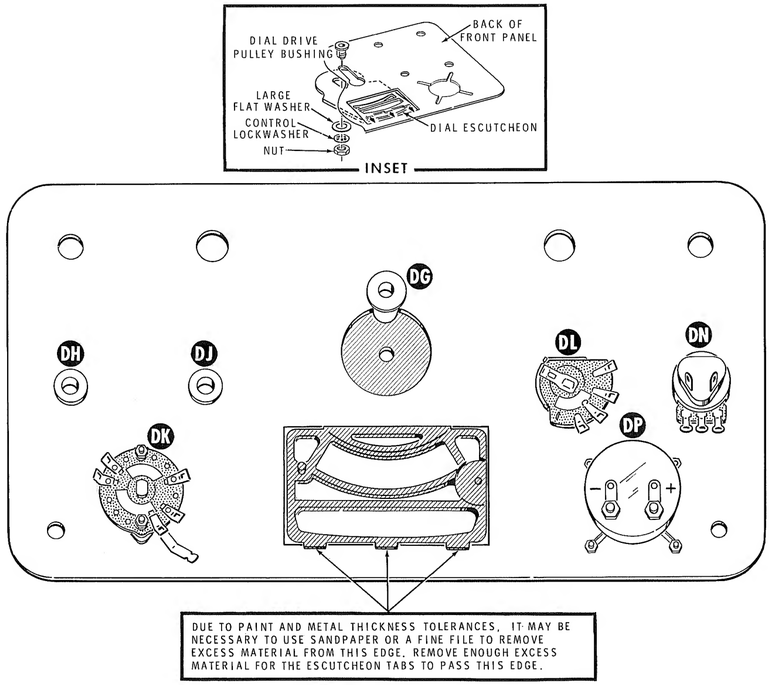
( ) Refer to Detail 13-17D and mount a 500 Ω control with SPST switch (#19-143) at DN on the front panel with a control lockwasher, a control flat washer, and a control nut. Position the control as shown.

( ) Remove the shorting clip from between lugs of the meter.

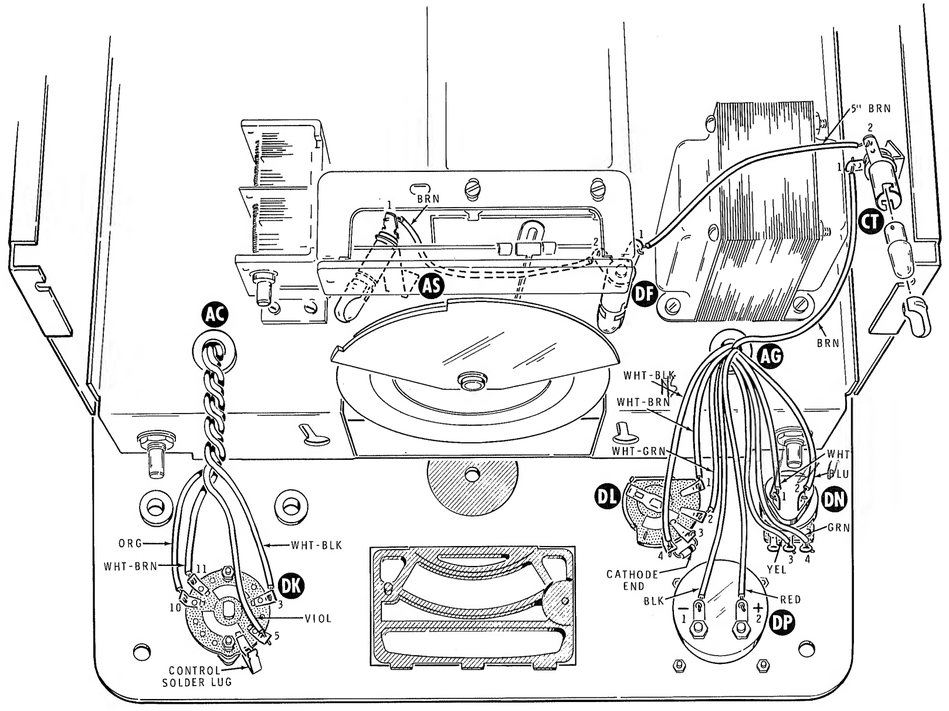
( ) Refer to Detail 13-17E and mount the meter at DP. Use the lockwashers and nuts furnished with the meter. Do not overtighten the nuts, as the plastic meter case can be broken.



PICTORIAL 13-16



PICTORIAL 13-17



PICTORIAL 13-18

Refer to Pictorial 13-18 (fold-out from this page) for the following steps.

( ) Position the front panel slightly under the edge of the chassis assembly as shown in the Pictorial.

( ) Bend the control solder lug on switch DK so it touches the indicated lug. Then solder the solder lug to switch lug 6.

Connect the wires from grommet AC to switch DK as follows:

( ) White-brown wire to lug 11 (S-1).

( ) Orange wire to lug 10 (S-1).

( ) White-black wire to lug 3 (S-1).

( ) Violet wire to lug 5 (S-1).

Disregard the large orange wire and the large violet wire. They will be connected later.

Connect the wires from grommet AG as follows:

( ) White-brown wire to lug 1 of switch DL (S-1).

( ) White-green wire to lug 2 of switch DL (S-1).

( ) White-black wire to lug 4 of switch DL (NS).

( ) White wire to lug 1 of control DN (S-1).

( ) Blue wire to lug 2 of control DN (S-1).

( ) Yellow wire to lug 3 of control DN (S-1).

( ) Green wire to lug 4 of control DN (S-1).

( ) Black wire to lug 1 of meter DP (S-1).

( ) Red wire to lug 2 of meter DP (S-1).

( ) Brown wire to lug 1 of lamp socket CT (S-1).

( ) Connect the cathode end of a 1N4149 diode to lug 3 of switch DL (S-1). Connect the other end to lug 4 of switch DL (S-2).

( ) Prepare a 3-1/2" brown wire and connect it from lug 2 of socket CT (S-1) to lug 1 of socket DF (S-1).

( ) Prepare a 4-1/2" brown wire and connect it from lug 2 of socket DF (S-1) to lug 1 of socket AS (S-1).

( ) Install a #47 pilot lamp in socket AS. Then mount a pilot lamp shield on the lamp. Position the shield as shown.

( ) Install a #47 pilot lamp in socket CT. Then mount a pilot lamp shield on the lamp. Position the shield as shown.

FRONT PANEL MOUNTING

Refer to Pictorial 13-19 for the following steps.

( ) Remove the control nuts from controls DA and DB.

( ) Loosen the control nut holding the dial drive bushing.

( ) Locate the silicone grease. Apply a very thin layer of silicone grease on the shaft of the dial drive pulley (large shaft). Be very careful not to get grease on the pulley or any other part of the Kit.

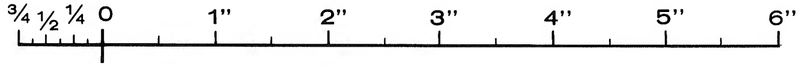
( ) Slide the shaft of the dial drive pulley into bushing DG. Then slowly rotate the dial drive pulley to evenly spread the grease on the pully shaft and the bushing. Push the bushing up as far as possible.

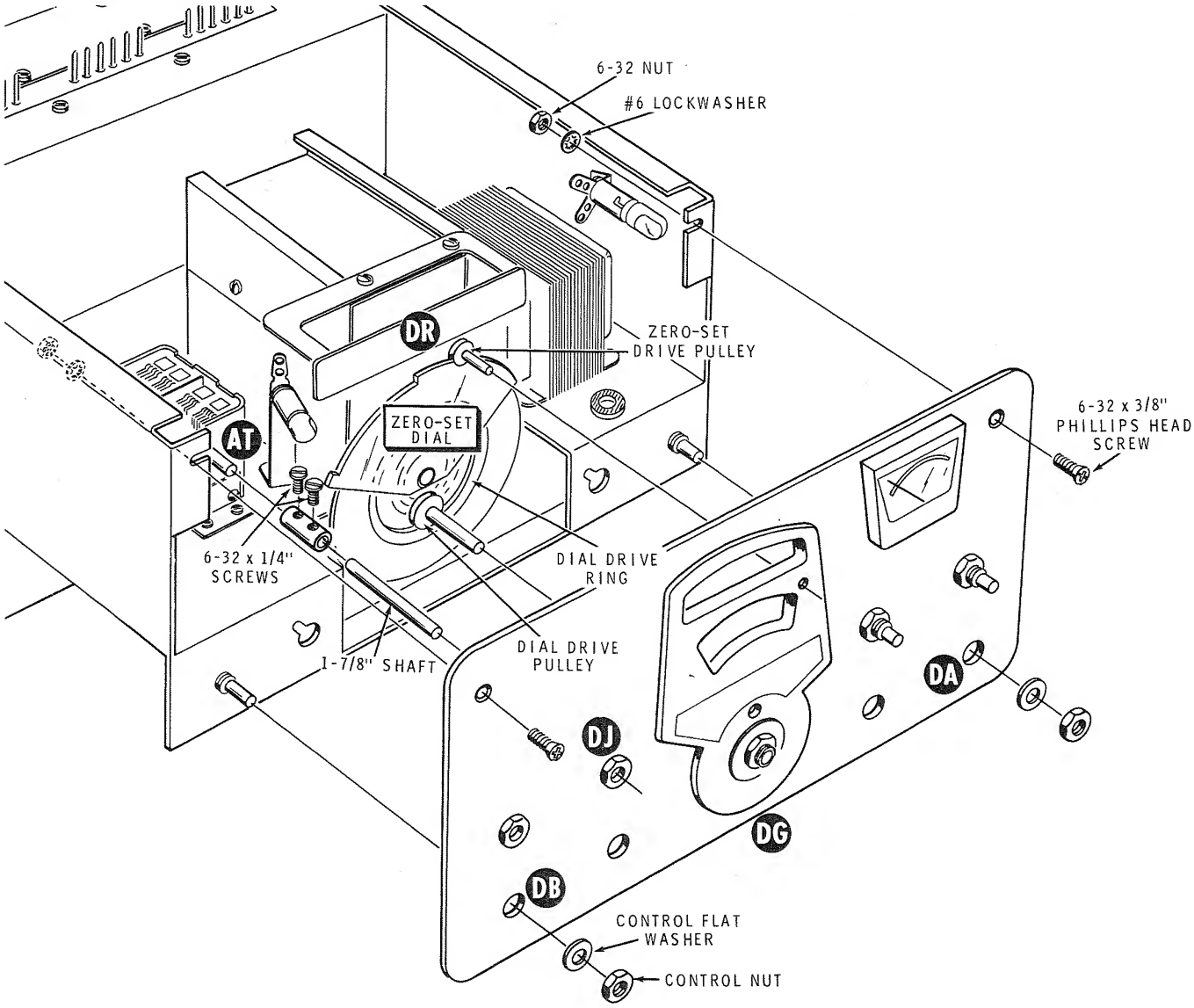
( ) Push the zero-set drive pulley (small shaft) onto the zero-set dial at DR. Position the pulley and dial as shown.

( ) Carefully position the front panel on the chassis assembly by inserting the shafts of controls DA and DB through the front panel and the zero-set drive pully DR through a small hole in the upper right-hand corner of the escutcheon. Also, be sure no wires are pinched between the front panel and the chassis assembly.

( ) Install control flat washers and control nuts on controls DA and DB. NOTE: Be sure the bottom edge of the front panel is even with the bottom edge of the chassis assembly after tightening the control nuts.

( ) Install 6-32 x 3/8" phillips head screws, #6 lockwashers, and 6-32 nuts at both top corners of the front panel. Push in the side panel while tightening the hardware in that corner.





PICTORIAL 13-19

( ) Push bushing DG down so the dial pulley engages with the circular dial drive ring. Use just enough pressure to rotate the circular dial without slippage. Tighten the bushing DG. The amount of torque required to turn the circular dial can be adjusted by moving the dial drive bushing up or down slightly.

( ) Locate a coupling and start two 6-32 x 1/4" screws in the coupling.

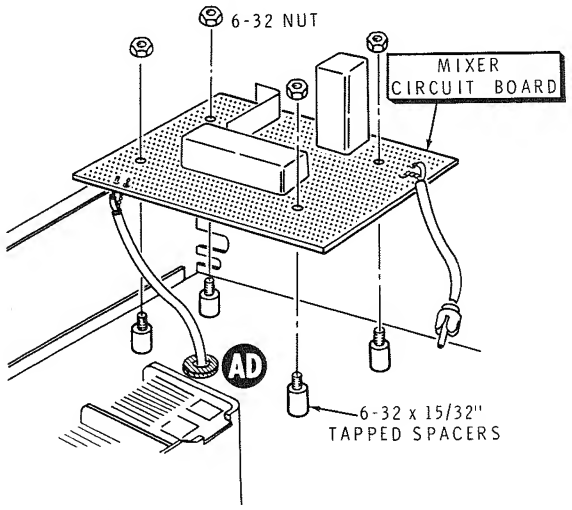
NOTE: There is a small zero-set stop stud on the back of the dial escutcheon. If the zero-set dial presses against this stud, the dial will not turn freely. Loosen the LMO mounting nuts and shift the LMO just enough to permit the zero-set dial to turn freely. Retighten the LMO mounting nuts.

( ) Tighten the coupling on the shaft of capacitor AT.

( ) Loosen bushing DJ.

( ) Insert a 1-7/8" shaft through bushing DJ and into the coupling on capacitor AT. Tighten the coupling on the shaft.

( ) Tighten the bushing DJ.



Detail 13-20A

CIRCUIT BOARD AND SWITCH-BOARD INSTALLATION

Refer to Pictorial 13-20 for the following steps.

NOTE: When installing the mixer circuit board in the next step, hold the two coaxial cables with phono plugs from slot CG up and out of the way.

( ) Refer to Detail 13-20A and insert the indicated coaxial cable from the mixer circuit board (#85-351-1) through grommet AD. Then position the circuit board on the four 6-32 x 15/32" tapped spacers. Mount the circuit board to the spacers with four 6-32 nuts.

( ) Plug the 4" coaxial cable phono plug from the mixer circuit board into the phono socket on the back of the LMO.

( ) Plug the coaxial cable phono plug from grommet AE into the IF OUT socket on the mixer circuit board.

( ) Plug the coaxial cable phono plug from variable capacitor AT into the RF IN socket on the mixer circuit board.

( ) Plug the short coaxial cable phono plug from slot CG into the HFO OUT socket on the mixer circuit board.

( ) Plug the long coaxial cable phono plug from slot CG into the LMO OUT socket on the mixer circuit board.

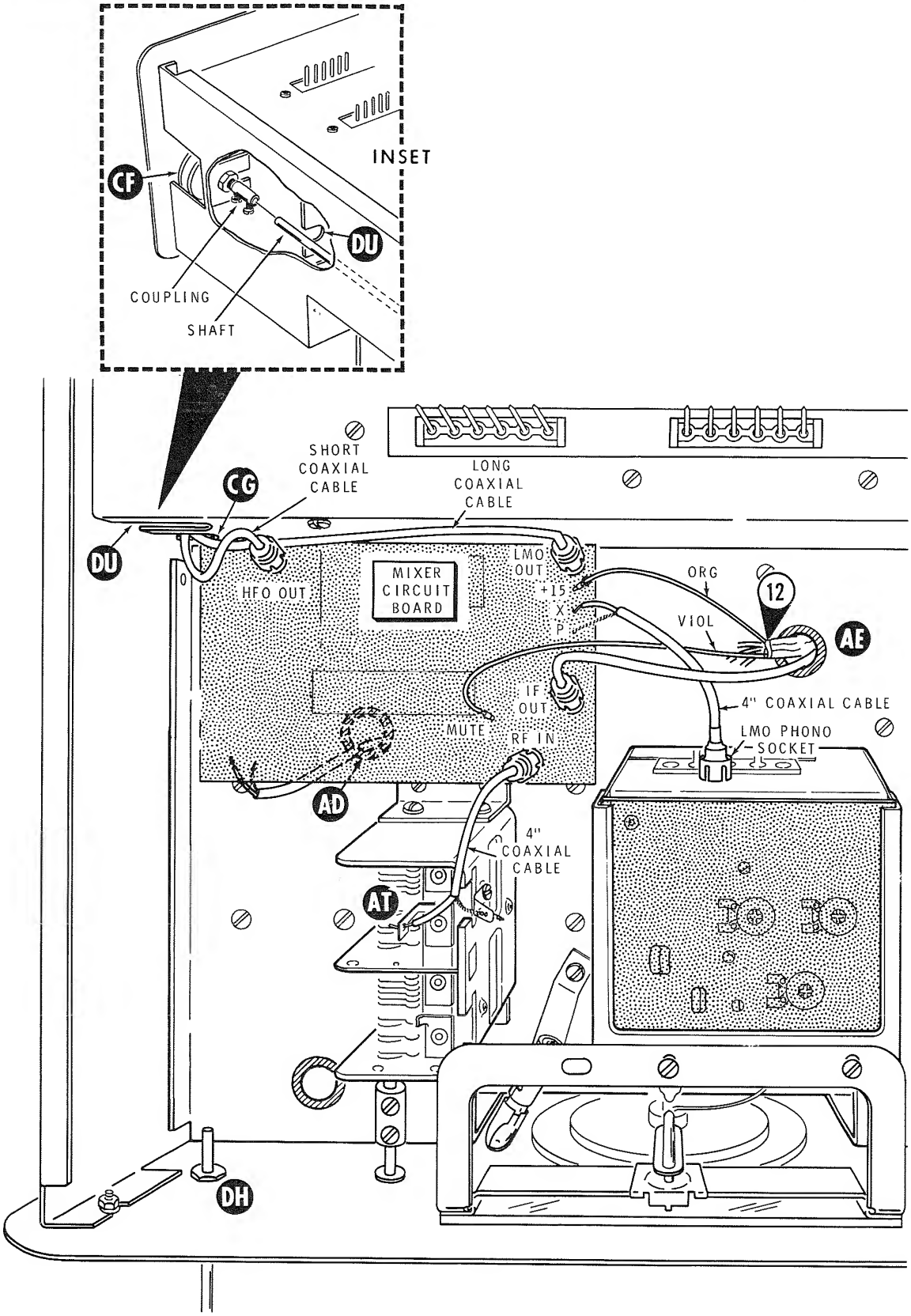
( ) Push the connector socket of the orange wire from grommet AE on the +15 connector pin on the mixer circuit board.

( ) Push the connector socket of the violet wire from grommet AE on the MUTE connector pin on the mixer circuit board.

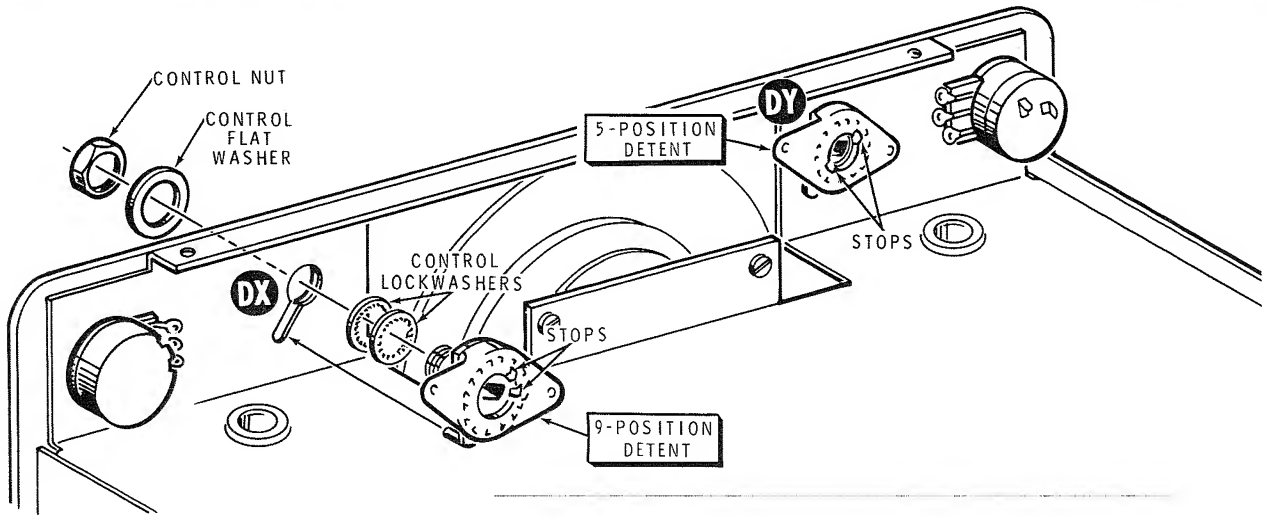
(✓) Loosen bushing DH.

(✓) Insert a 10-3/4" shaft through bushing DH and chassis slot DU. Refer to the inset drawing on the Pictorial and insert the shaft into the coupling on switch CF. Tighten the coupling.

(✓) Tighten bushing DH.



PICTORIAL 13-20



PICTORIAL 13-21

Refer to Pictorial 13-21 for the following steps.

( ) Position the Receiver bottom-side-up as shown.

( ) Mount the 9-position switch detent (#266-160) on the front panel at DX with <u>two</u> control lockwashers, a control flat washer, and a control nut. Tighten the detent only finger tight.

( ) Mount the 5-position switch detent (#266-159)on the front panel at DY with <u>two</u> control lockwashers, a control flat washer, and a control nut. Tighten the detent only finger tight.

Refer to Detail 13-22A for the following steps.

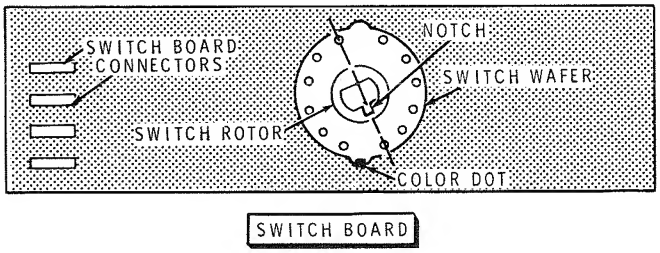
NOTE: In the following steps, the switch rotors must be properly positioned before the Switch-Boards are installed in the Receiver. Perform this operation as accurately as possible using the 7-1/2" shaft. Once the switch rotor is properly aligned, lay the Switch-Board aside until it is called for.

( ) Position the crystal Switch-Board as shown. Then turn the switch rotor to align the notch one position counterclockwise from the color dot on the switch wafer. There is no switch lug at this position.

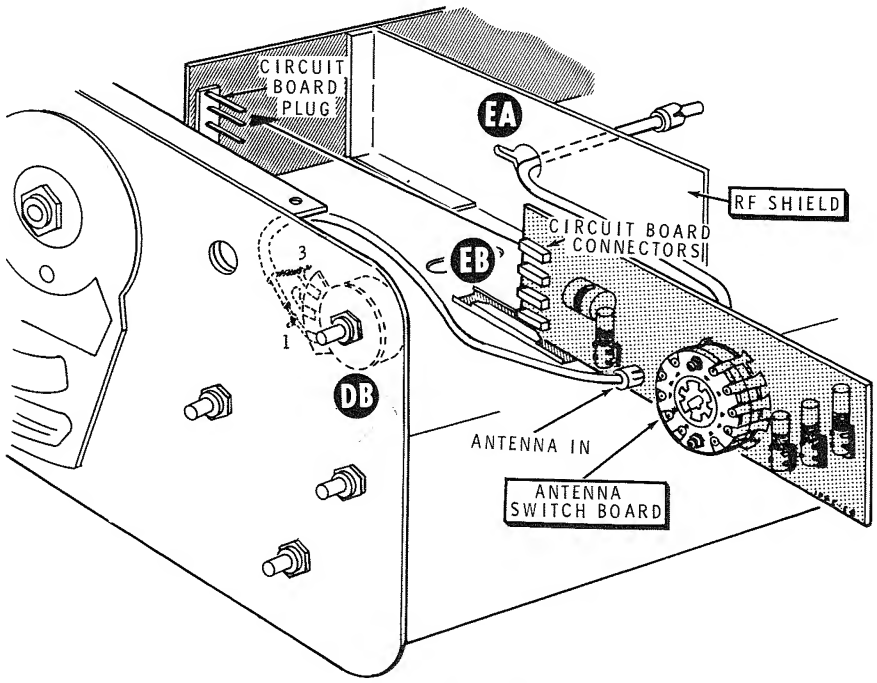
( ) In the same manner, align the switch rotor on the heterodyne oscillator (HET OSC) Switch-Board. Align the rotor notch one position counterclockwise from the color dot on the switch wafer.

( ) Align the switch rotor on the RF amplifier (RF AMP) Switch-Board. Align the rotor notch one position counterclockwise from the color dot on the switch wafer.

( ) Align both switch rotors on the antenna Switch-Board. Align the rotor notch one position counterclockwise from the color dot on the switch wafer.



Detail 13-22A



Detail 13-22B

Refer to Pictorial 13-22 (fold-out from Page 101) for the following steps.

NOTE: When plugging phono plugs into the Switch-Board phono sockets in the following steps, be careful the board does not bend. The foil may be damaged.

( ) Refer to Detail 13-22B and connect the short coaxial cable coming from control DB lug 1 to the ANTENNA IN jack on the antenna Switch-Board.

( ) Slide the antenna Switch-Board into circuit board clip EB. Then slide the Switch-Board into the Receiver until the circuit board connectors seat onto the circuit board plug pins.

( ) Route the coaxial cable coming from the foil side of the antenna Switch-Board through hole EA in the RF shield.

( ) Connect the large red wire coming from lug 2 of tuning capacitor DE to connector pin B on the foil side of the antenna Switch-Board.

( ) Connect the large red wire coming from lug 1 of tuning capacitor DE to connector pin A on the foil side of the antenna Switch-Board.

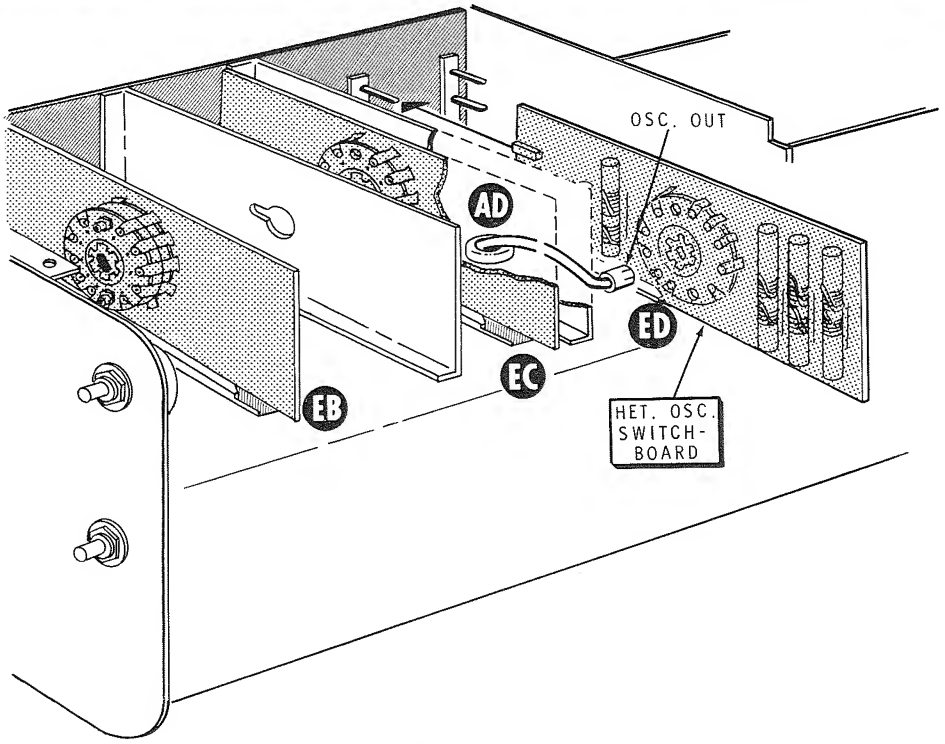
( ) Connect the coaxial cable coming from hole EA in the RF shield to the RF IN jack on the RF amplifier Switch-Board.

( ) Slide the RF amplifier Switch-Board into circuit board clip EC. Then slide the Switch-Board into the Receiver until the circuit board connectors seat onto the circuit board plug pins.

NOTE: Use a pair of long-nose pliers to make the next two connections.

( ) Connect the large red wire coming from lug 3 of tuning capacitor DE to connector pin C on the RF amplifier Switch-Board.

( ) Connect the large red wire coming from lug 4 of tuning capacitor DE to connector pin D on the RF amplifier Switch-Board.



Detail 13-22C

( ) Refer to Detail 13-22C and connect the coaxial cable coming from grommet AD to the OSC OUT jack on the heterodyne oscillator Switch-Board.

( ) Slide the heterodyne oscillator Switch-Board into Receiver circuit board clip ED until the circuit board connectors seat onto the circuit board plug pins.

( ) Slide the crystal Switch-Board into circuit board clip EE. Then slide the Switch-Board into the Receiver until the circuit board connectors seat onto the circuit board plug pins.

( ) Connect the large red wire coming from the foil side of the heterodyne oscillator Switch-Board to the XTAL pin on the crystal Switch-Board.

Refer to Detail 13-22D for the next two steps.

( ) Slightly loosen the control nut on switch detent DX.

( ) Insert the flattened end of a 7-1/2" shaft just through switch detent DX. Be sure the flat side at the other end of the shaft is positioned as shown. Do not insert the shaft through the Switch-Boards at this time.

( ) Rotate the switch detent fully counterclockwise using the shaft if not already counterclockwise.

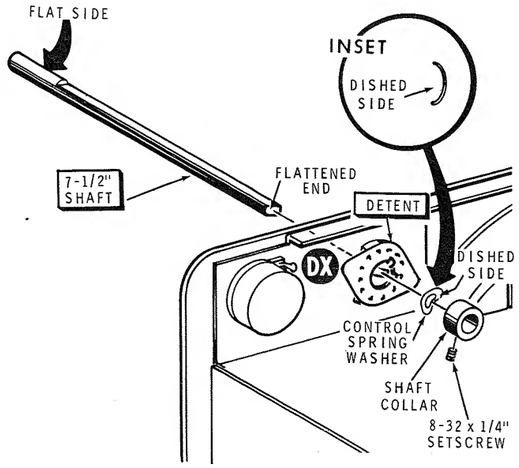
( ) Slide a control spring washer over the flattened end of the 7-1/2" shaft with the dished side away from the detent.

( ) Start an 8-32 x 1/4" setscrew into a shaft collar.

( ) Slide the shaft collar over the flattened end of the 7-1/2" shaft. Do not tighten the setscrew.

NOTE: In the following steps, the 7-1/2" shaft will be inserted through the switch rotors of the Switch-Boards. Be very careful so you do not break a switch rotor. The switch rotors may have to be moved slightly to allow the shaft to pass.

( ) Insert the flattened end of the 7-1/2" shaft through the switch rotors on the antenna, RF amplifier, heterodyne oscillator, and crystal Switch-Boards.

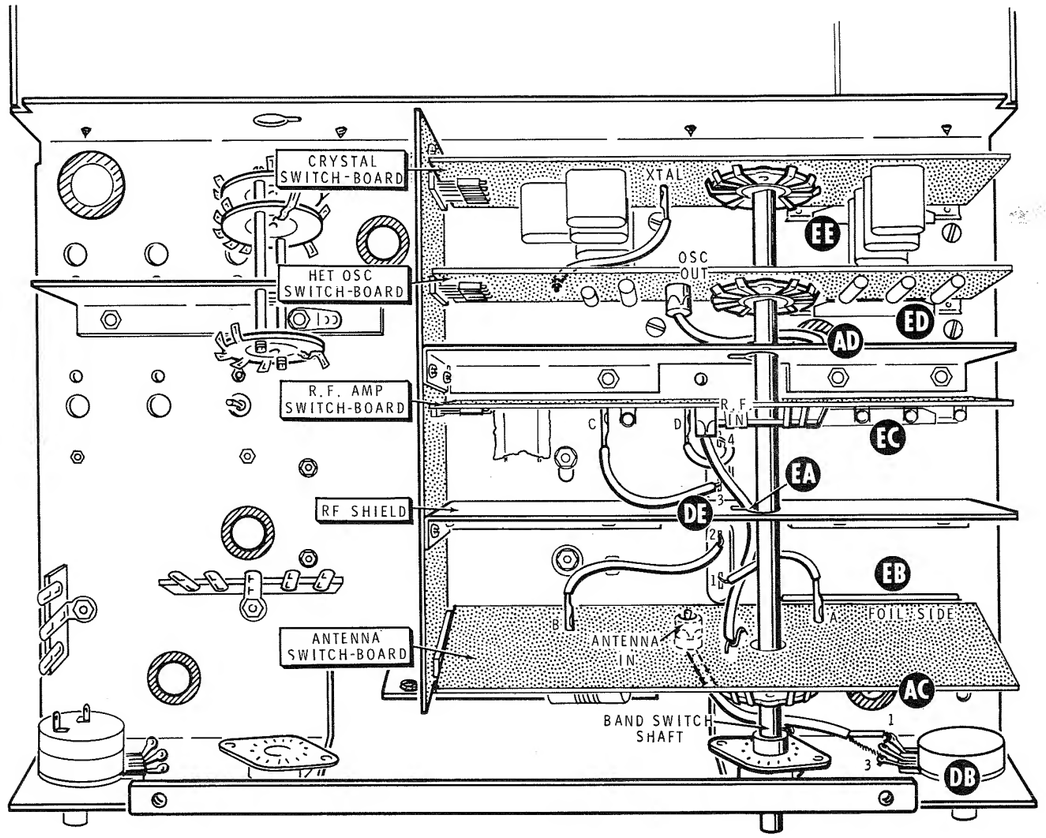


Detail 13-22D

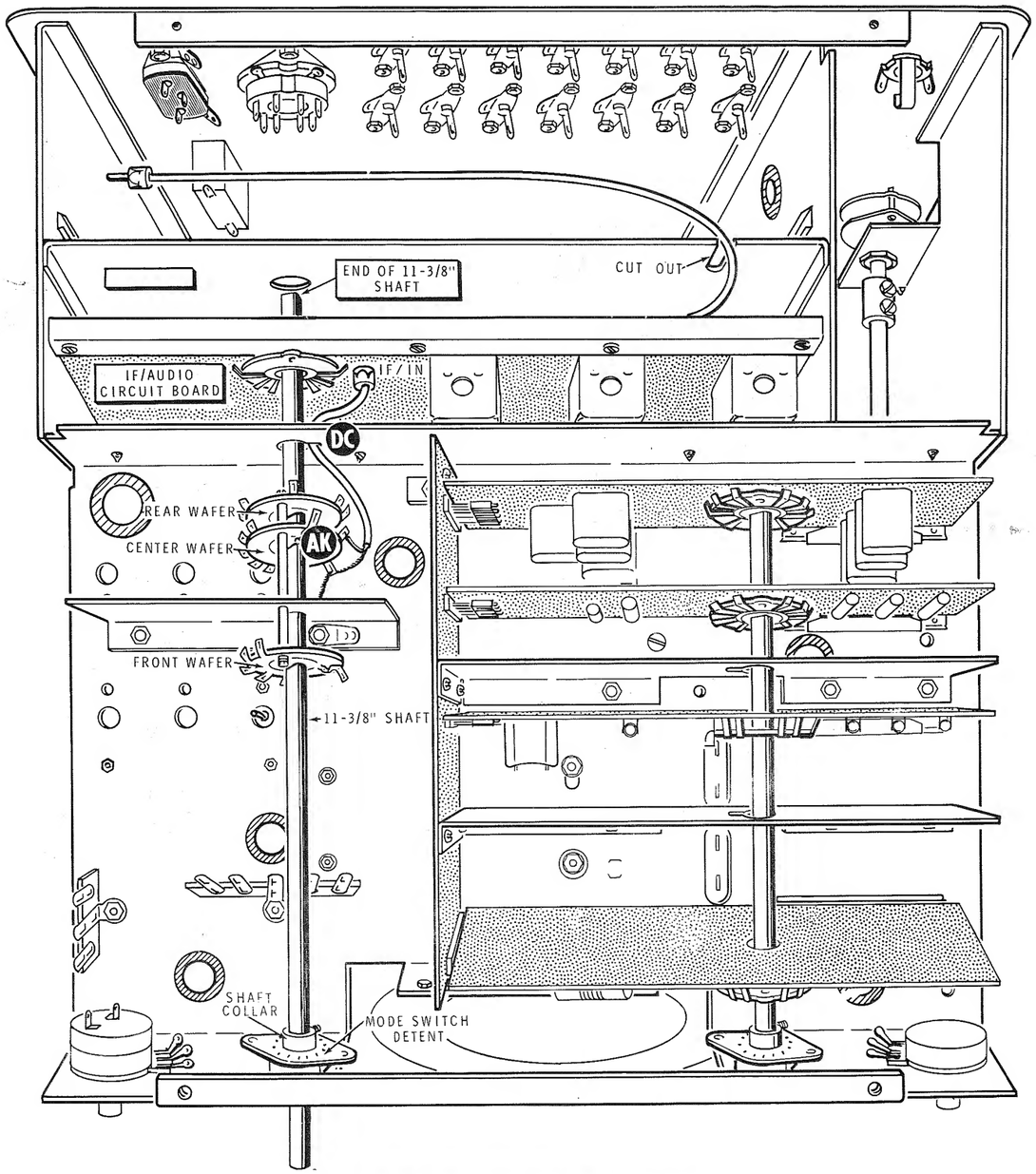
( ) Push in on the shaft until it reaches its stop. Grasp the open end of the shaft with a pair of pliers and turn the shaft two clicks clockwise.

( ) While holding the end of the shaft, press the shaft collar toward the front panel to depress the control spring washer. Tighten the shaft collar setscrew onto the flat portion of the shaft.

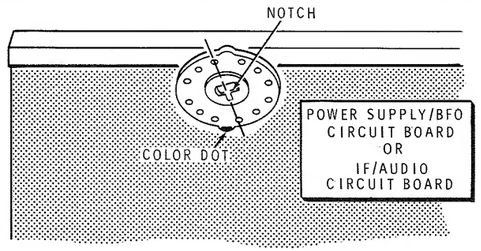
( ) Tighten the control nut on switch detent DX.

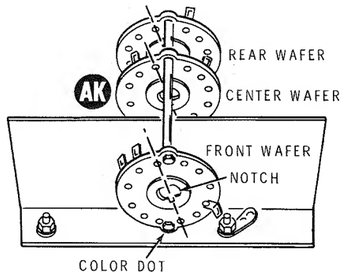


PICTORIAL 13-22



PICTORIAL 13-23





Detail 13-23A

Refer to Detail 13-23A for the following steps.

( ) Use the 11-3/8" shaft and turn the rotor of the power supply/BFO circuit board switch wafer to align the notch one position counterclockwise from the color dot.

( ) Set the power supply/BFO circuit board aside without moving the rotor. This board will be installed later.

( ) Use the 11-3/8" shaft and turn the rotor of the IF/audio circuit board switch wafer to align the notch one position counterclockwise from the color dot.

NOTE: To align the rotors in the next step, insert a 11-3/8" shaft through switch detent DY and use the flattened end of this shaft to align the rotors. Then remove the shaft from the Receiver.

( ) Align the switch rotor in the front wafer, center wafer and rear wafer of switch AK. Turn each rotor so the notch aligns one position counterclockwise from the color dot.

Refer to Pictorial 13-23 (fold-out from this page) for the following steps.

( ) Loosen the six #6 x 1/4" sheet metal screws holding the IF audio connector plate to the rear chassis. This will permit the connector pins to properly align with the circuit board connectors.

( ) Similarly loosen the six #6 x 1/4" sheet metal screws holding the PS/BFO connector plate to the rear chassis.

( ) Refer to Detail 13-23B and slide the IF/audio circuit board into the circuit board clips. Slide the circuit board into the Receiver until the circuit board connectors seat onto the circuit board plug pins. Push the board down until the support rail is level with the sides of the compartment.

( ) Insert the coaxial cable with phono plug coming from the center wafer of switch AK through hole DC.

( ) Connect the coaxial cable coming from hole DC to the IF IN jack on the IF/audio circuit board.

( ) Route the coaxial cable coming from the foil side of the IF/audio circuit board through the cutout in the IF shield as shown.

Refer to Detail 13-23C for the next five steps.

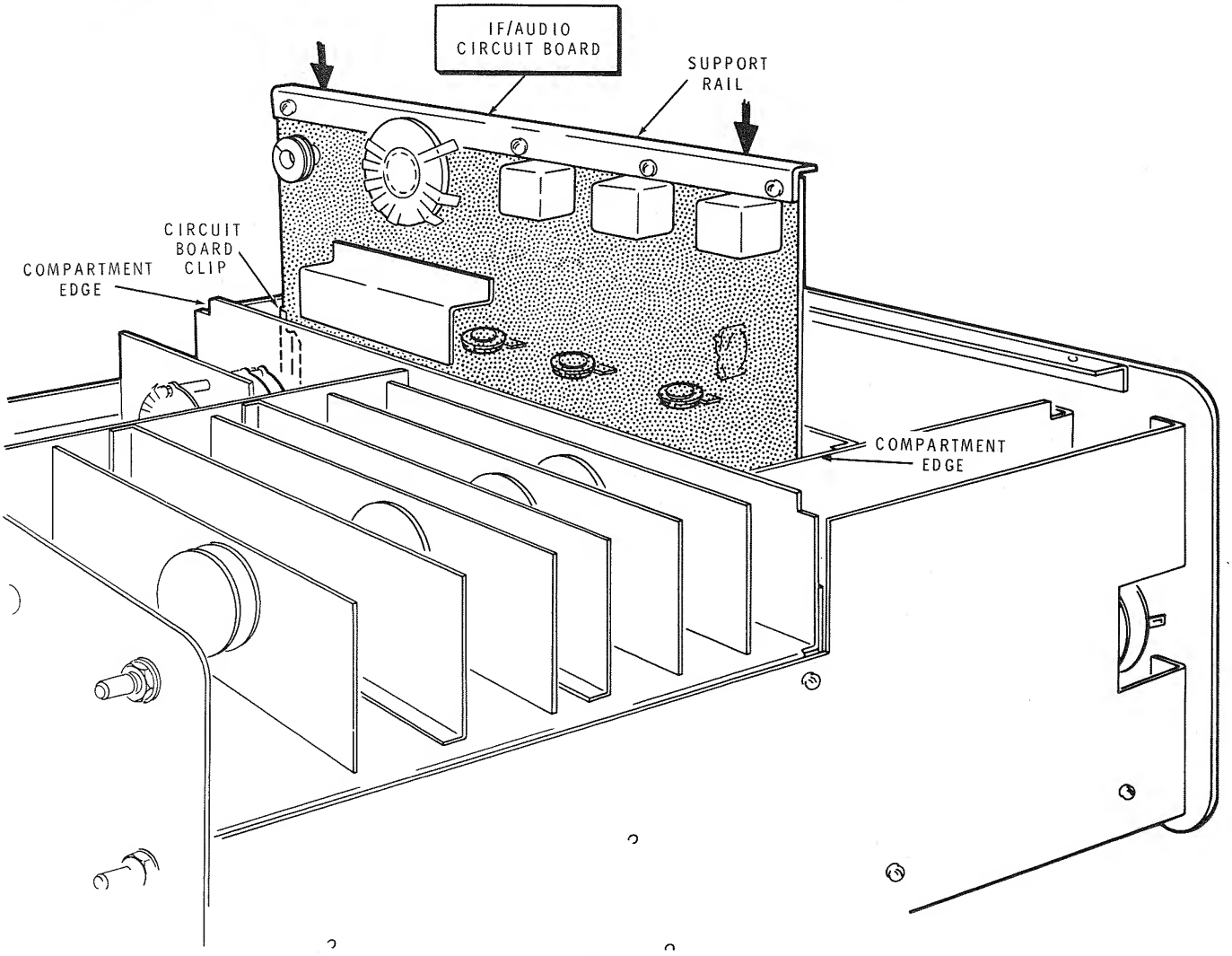
( ) Insert the flattened end of the 11-3/8" shaft just through detent DY. Be sure the flat side on the other end of the shaft is positioned as shown.

( ) Rotate the 11-3/8" shaft fully counterclockwise.

( ) Slide a control spring washer onto the flattened end of the 11-3/8" shaft with the dished side away from the front panel.

( ) Start an 8-32 x 1/4" screw into a shaft collar.

( ) Slide the shaft collar onto the flattened end of the 11-3/8" shaft. Do not tighten the setscrew.



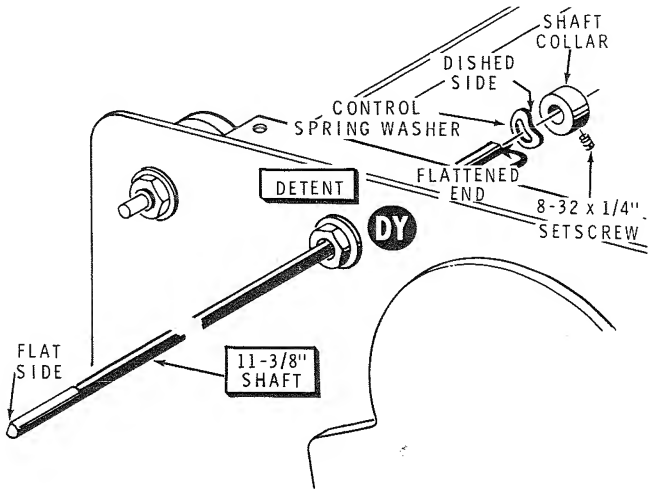
Detail 13-23B

( ) Insert the flattened end of the 11-3/8" shaft through the switch rotors of switch AK. Be sure the switch rotors line up with the shaft to prevent damage to the switch wafers or rotors.

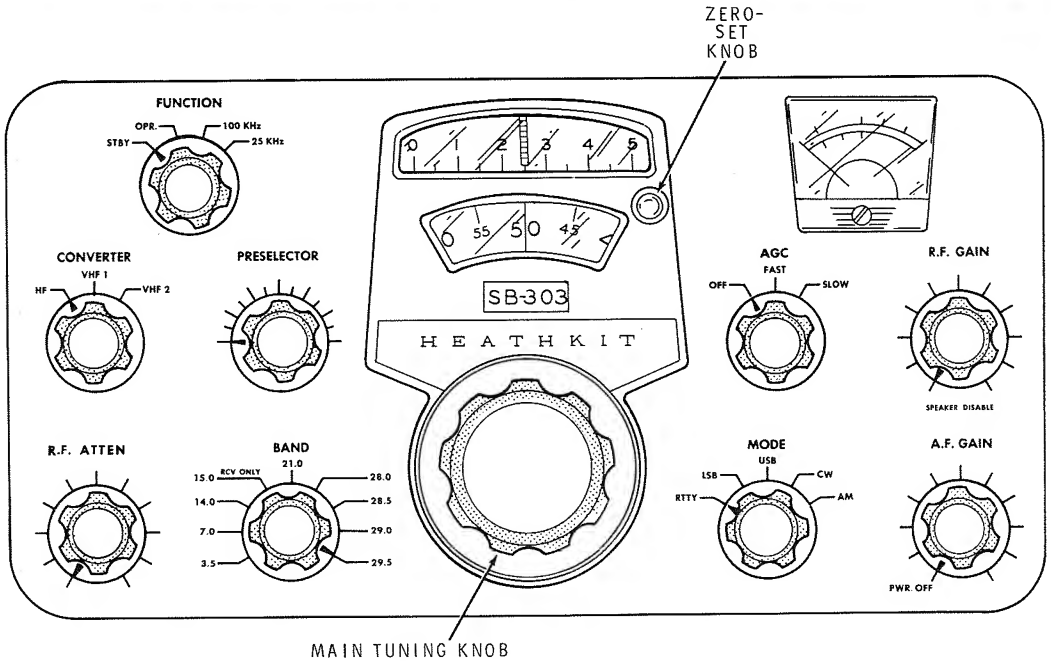
( ) Insert the flattened end of the 11-3/8" shaft through the rotor of the IF/audio circuit board switch wafer. Do not push the shaft end past the IF shield.

( ) Retighten the six #6 x 1/4" sheet metal screws holding the IF audio connector plate to the rear chassis.

The 11-3/8" shaft will be completely installed later.



Detail 13-23C



PICTORIAL 13-24

KNOB INSTALLATION

Refer to Pictorial 13-24 for the following steps.

NOTE: Use the large allen wrench to install knobs in the following steps.

( ) Refer to Detail 13-24A and start an 8-32 x 1/4" setscrew into each of the small knobs.

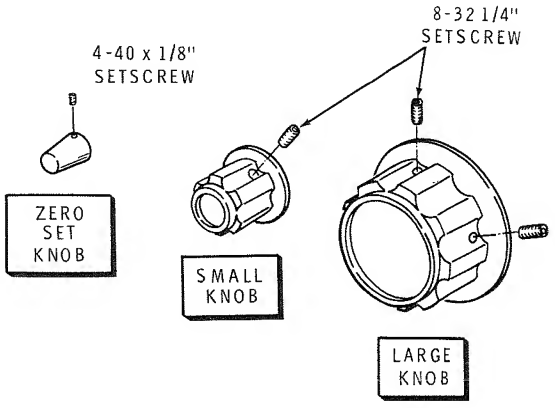
( ) Refer to Detail 13-24A and start two 8-32 x 1/4" setscrews into the large knob.

( ) Install the large main tuning knob on the shaft of the LMO and tighten both setscrews.

( ) Turn the Band shaft fully clockwise, and install a small knob on the shaft. Set the pointer in the 29.5 position and tighten the setscrew.

( ) Turn the Mode shaft fully counterclockwise. Be careful that you do not push in or pull out on this shaft.

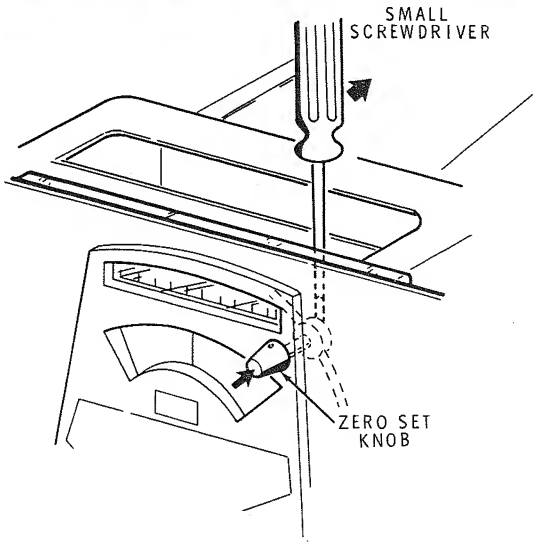
( ) Turn the remaining shafts on the front panel fully counterclockwise (all except the zero set shaft).



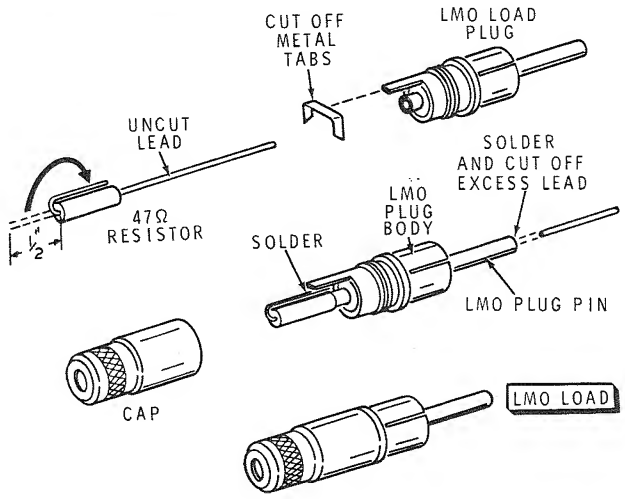
Detail 13-24A

( ) Install a small knob on each shaft, set each pointer as shown in the Pictorial, and tighten each setscrew.

( ) Refer to Detail 13-24A and start a 4-40 x 1/8" setscrew in the zero-set knob using the small allen wrench.



Detail 13-24B



PICTORIAL 13-25

( ) Refer to Detail 13-24B and use a small screwdriver to push forward on the zero-set drive pulley while you install the zero-set knob.

( ) Remove the protective backing from the SB-303 nameplate and install the nameplate in the escutcheon.

LMO LOAD

Refer to Pictorial 13-25 for the following steps.

( ) Locate the LMO plug and unscrew the cap from the back of the plug.

( ) Cut the metal tabs off the LMO plug as shown.

( ) Cut one lead of a 47 Ω (yellow-violet-black) resistor to a length of 1/2". Then bend this 1/2" lead back over the resistor body as shown.

( ) Insert the uncut lead through the center of the LMO plug until the resistor body is seated against the LMO plug.

( ) Solder the resistor lead to the LMO plug pin and cut off the excess lead length.

( ) Solder the other resistor lead to the LMO plug body.

( ) Replace the cap onto the back of the LMO plug.

NOTE: Two 68 Ω (blue-gray-brown) resistors and one 270 Ω (red-violet-brown) resistor should be left over. These resistors are provided for modifying either the SB-400 or SB-401 transmitter. The modifications are provided in the "Installation" section of the Manual.

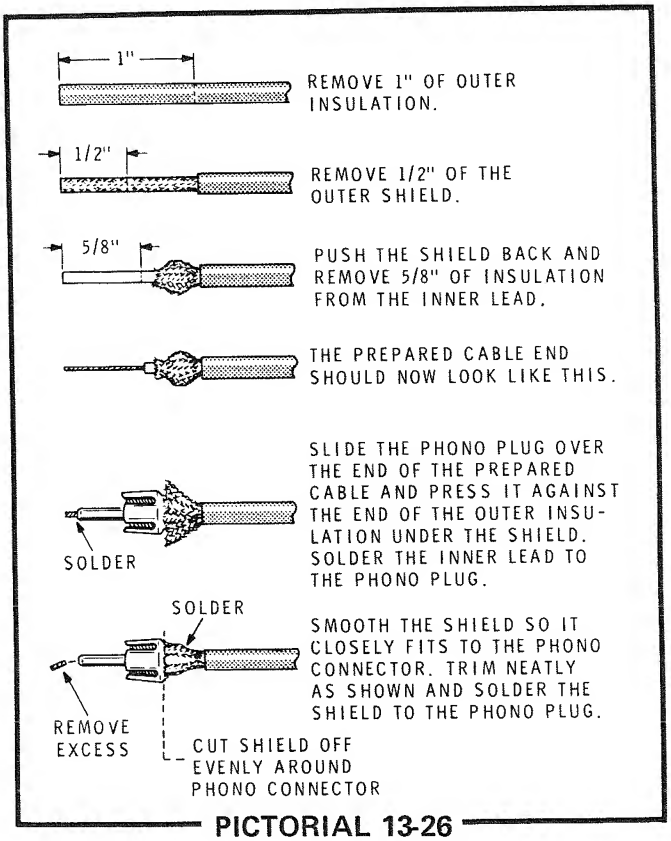
TRANSCEIVE CABLE PREPARATION

Transceive operation cables for LMO OUT, BFO OUT, and HFO OUT phono sockets will be made up at this time.

Refer to Pictorial 13-26 for the next two steps.

( ) Cut a 24" length of RG-62/U (large) coaxial cable and install a phono plug on each end as shown.

( ) Cut another 24" length of RG-62/U (large) coaxial cable and install a phono plug on each end as shown.

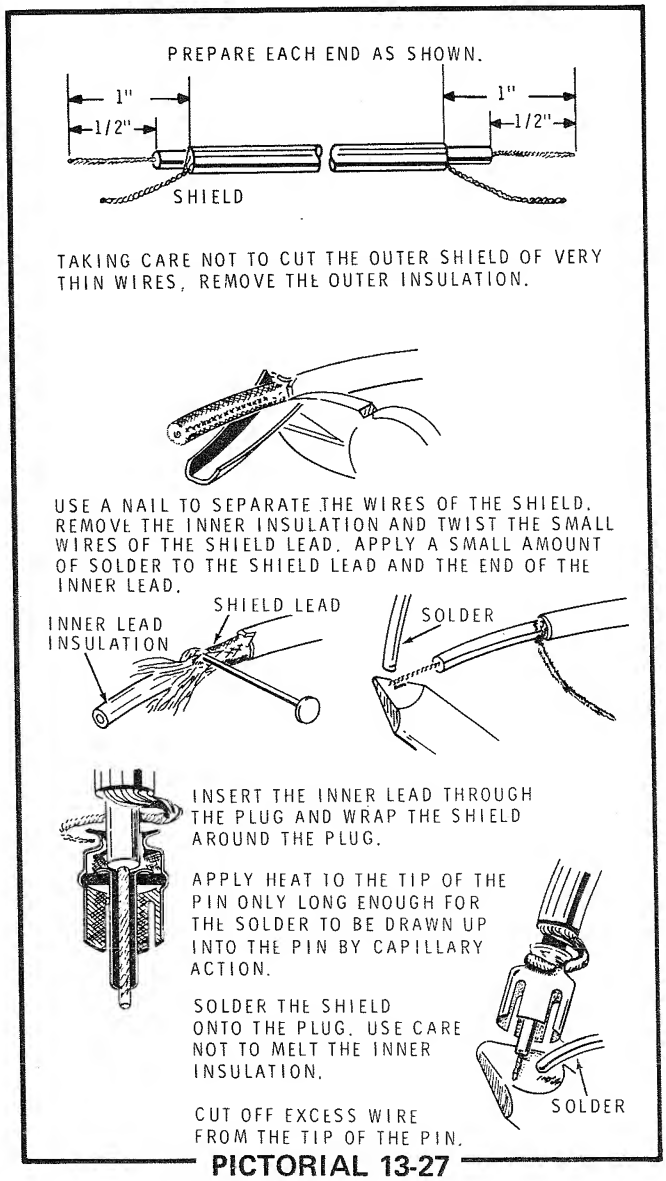


PICTORIAL 13-26

Refer to Pictorial 13-27 for the following step.

( ) Cut a 24" length of RG-174/U (small) coaxial cable and install a phono plug on each end as shown.

Set these coaxial cables aside until they are called for.



PICTORIAL 13-27

INITIAL TESTS

Use a high input impedance voltmeter to perform the following tests to be sure that the Kit has been wired properly and that no short circuits exist in the power supply circuits.

RESISTANCE CHECKS

Power Supply/BFO Circuit Board

( ) Turn on your ohmmeter and allow it to warm up.

( ) Position the power supply/BFO circuit board as shown in Figure 1.

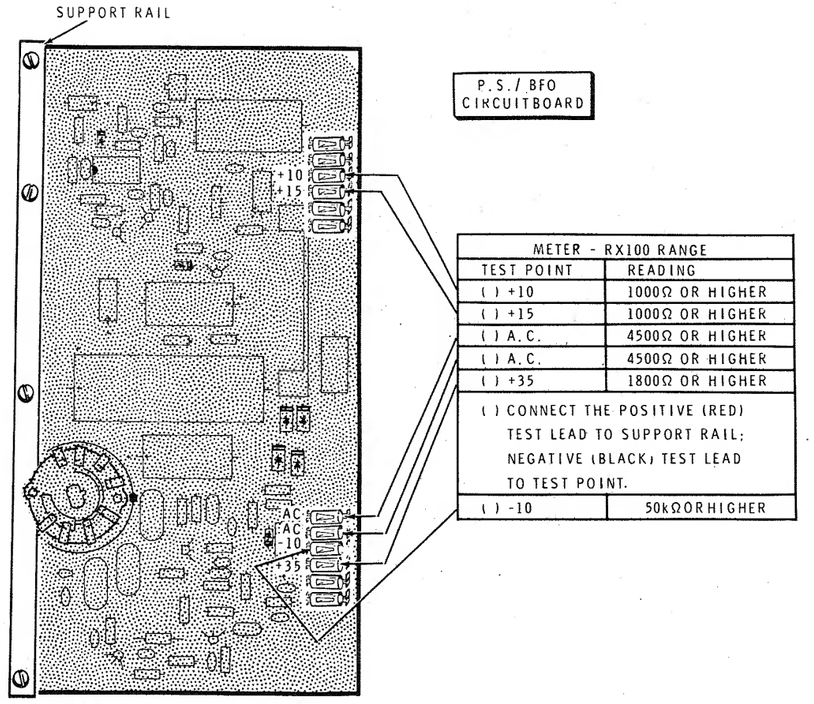
( ) Connect the negative (black) ohmmeter test lead to the support rail.

NOTE: The internal wiring of most ohmmeters is such that the positive terminal of the meter battery is connected to the positive (red) test lead and the negative battery terminal is connected to the negative (black) test lead. In some ohmmeters this wiring is reversed and erroneous readings will be obtained when making the following measurements. Try reversing the ohmmeter leads if the measurements do not check out correctly the first time.

Perform the resistance checks by connecting the positive (red) ohmmeter test lead to each test point listed in the following chart.

Some readings will take a few seconds to reach the indicated resistance because of the slow charging rate of capacitors in some of the circuits being checked.

If any of your readings do not agree with the resistance readings shown in the chart, refer to the power supply/BFO circuit board part of the "In Case of Difficulty" section of the manual and repair any difficulties before proceeding.



METER - RX100 RANGE	
TEST POINT	READING
( ) +10	1000Ω OR HIGHER
( ) +15	1000Ω OR HIGHER
( ) A.C.	4500Ω OR HIGHER
( ) A.C.	4500Ω OR HIGHER
( ) +35	1800Ω OR HIGHER
( ) CONNECT THE POSITIVE (RED) TEST LEAD TO SUPPORT RAIL; NEGATIVE (BLACK) TEST LEAD TO TEST POINT.	
( ) -10	50kΩ OR HIGHER

FIGURE 1

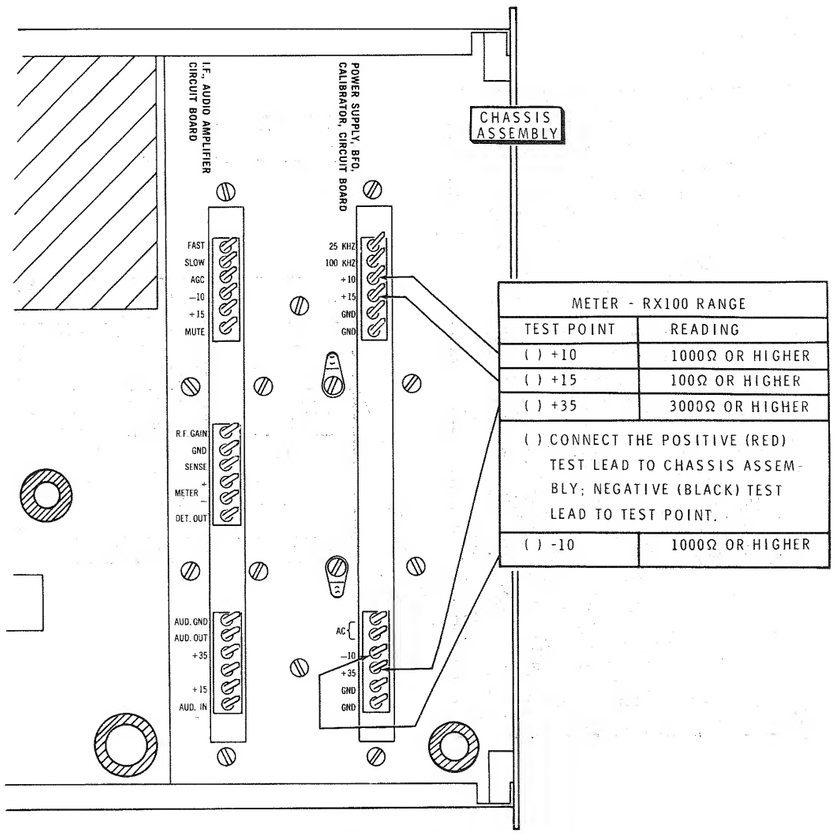


FIGURE 2

Chassis Assembly

( ) Set the controls and switches as follows. Do not connect the power cord.

FUNCTION – 100 kHz
CONVERTER – HF
PRESELECTOR – Any
R.F. ATTEN – Fully clockwise
BAND – Any
AGC – Fast
RF GAIN – Fully clockwise, pushed in
MODE – Any
AF GAIN – 9 o'clock

( ) Position the chassis assembly as shown in Figure 2 (fold-out from this Page).

( ) Connect the negative (black) ohmmeter test lead to the chassis assembly.

( ) Connect the positive (red) ohmmeter test lead to each test point listed in the chart on Figure 2.

If any of your readings do not agree with the resistance readings shown in the chart, refer to the "In Case of Difficulty" section of this Manual and repair any difficulty before proceeding.

POWER SUPPLY/BFO CIRCUIT BOARD INSTALLATION

Refer to Figure 3 for the following steps.

( ) Position the circuit board as shown, and plug the coaxial cable coming from the IF/audio amplifier circuit board into the indicated phono socket on the component side of the power supply/BFO circuit board.

( ) Insert the circuit board partially into the guides.

( ) Plug the coaxial cable coming from the rear panel BFO OUT phono socket into the BFO OUT phono socket on the foil side of the power supply/BFO circuit board.

( ) Plug the remaining coaxial cable coming from the converter switch into the CAL OUT phono socket on the foil side of the power supply/BFO circuit board.

NOTE: When pressing the circuit board into place in the following step, be sure the coaxial cable from the IF/audio circuit board does not get under the heat sink.

( ) Carefully press the circuit board down into place so all pins make connection. Push the board down until the support rail is level with the sides of the compartment.

( ) Push the 11-3/8" (mode) shaft into the wafer switch rotor hole while slightly wiggling the shaft. The circuit board may have to be repositioned slightly to properly align the rotor hole with the shaft.

( ) Push the mode shaft all the way in and then rotate the knob fully clockwise.

( ) Temporarily remove the knob from the shaft and tighten the switch detent. Reinstall the knob on the shaft.

( ) Tighten the six #6 x 1/4" sheet metal screws holding the PS/BFO connector plate to the rear chassis.

Refer to Figure 4 for the next step.

( ) Position the collar with the setscrew as indicated. While pressing the collar against the spring washer and switch detent, tighten the collar setscrew with the long allen wrench.

( ) Tighten the hardware at AJ and AK on the switch bracket as shown in the Figure.

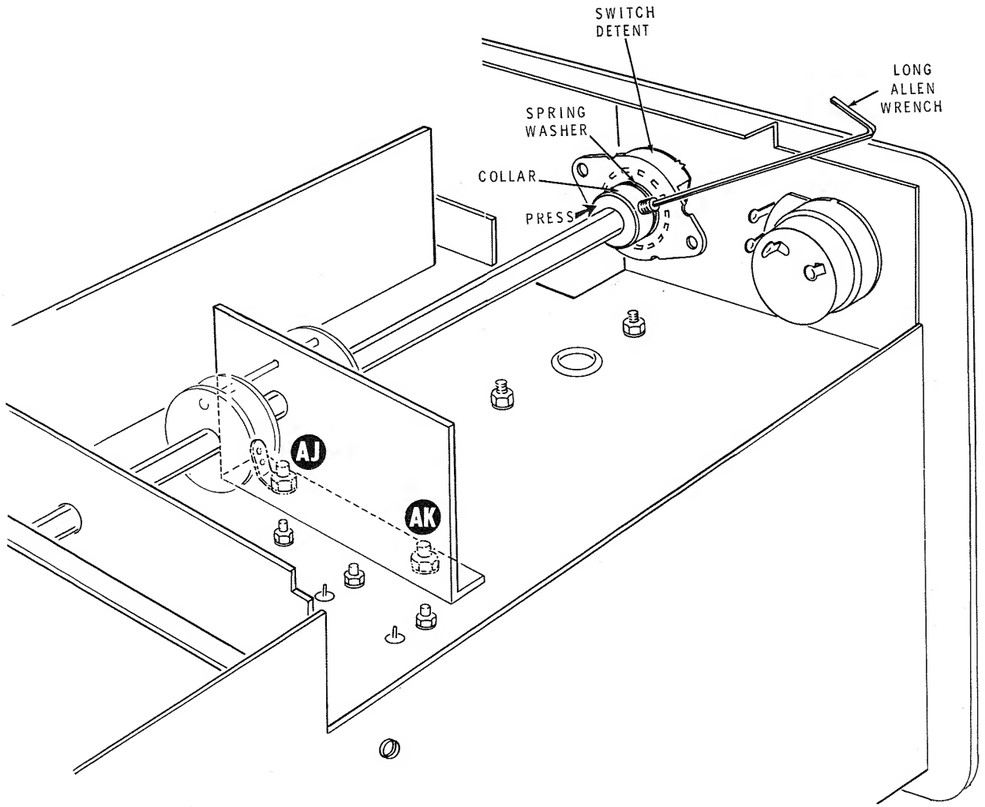
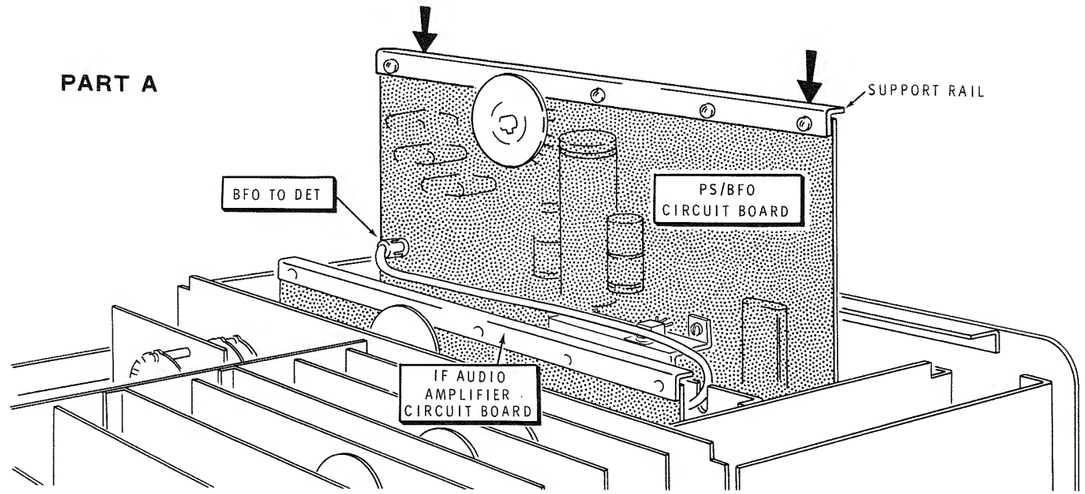


Figure 4



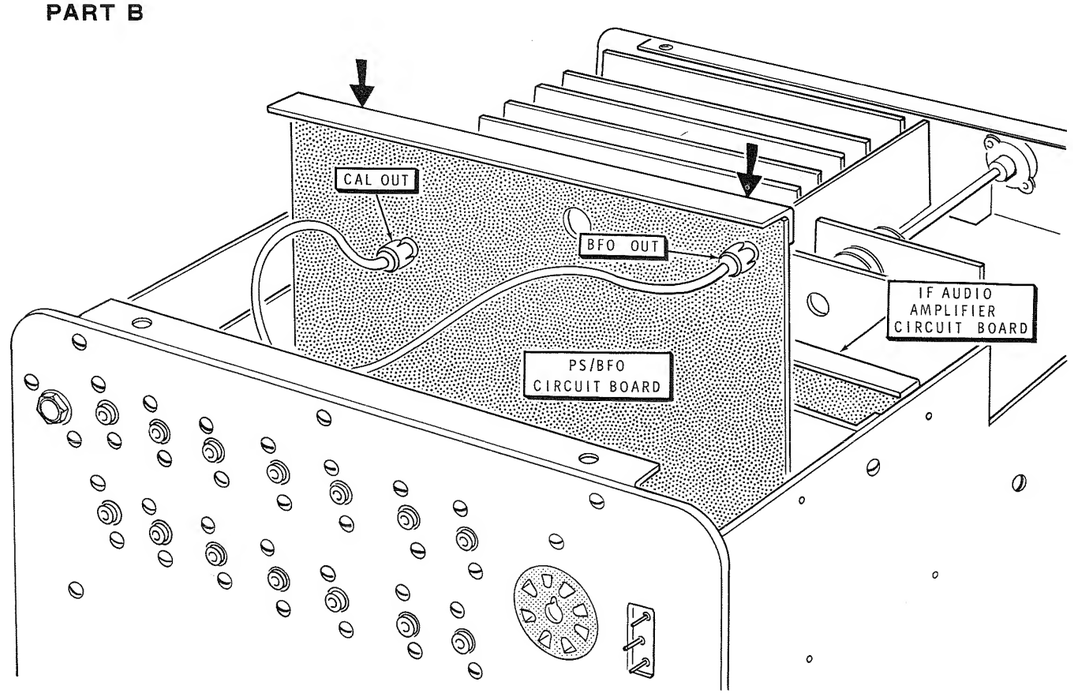


FIGURE 3

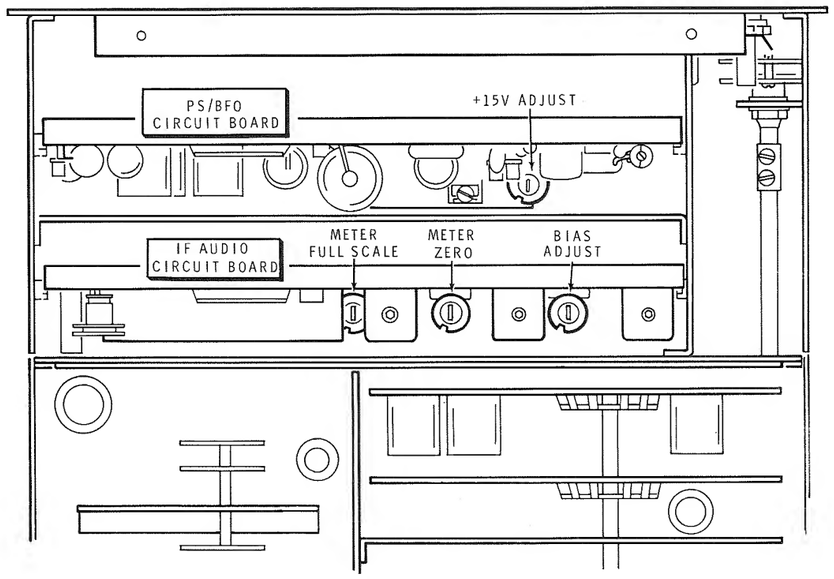

PS/BFO
CIRCUIT BOARD
+15V ADJUST
IF AUDIO
CIRCUIT BOARD
METER
FULL SCALE
METER
ZERO
BIAS
ADJUST

FIGURE 5

ALIGNMENT

( ) Turn on your high input impedance voltmeter and allow it to warm up.

NOTE: The Receiver can be aligned with instruments or without instruments. Instrument alignment may result in a slight increase in sensitivity. However, it requires the use of an RF generator that can deliver a signal from 3.5 MHz to 30 MHz. If a generator is available, plug it in and turn it on at this time to allow it to warm up. DO NOT USE A VOLT-OHMMETER OR LOW-IMPEDANCE METER DURING THE ALIGNMENT PROCEDURE.

ALIGNMENT PREPARATION

PRESETTING CONTROLS

( ) Set the front panel controls and switches to the following positions:

FUNCTION – STBY
CONVERTER – HF
PRESELECTOR – Any
R.F. ATTEN – Fully clockwise
BAND – 3.5
MAIN TUNING – 0.00
AGC – OFF
RF GAIN – Fully clockwise and pushed in
MODE – USB
AF GAIN – PWR OFF

Refer to Figure 5 (fold-out from Page 110) for the following steps.

( ) Set each of the following controls on the IF/audio circuit board to the center of its rotation: BIAS ADJ, METER ZERO, and METER FS (full scale).

( ) Set the +15 ADJ control on the power supply/BFO circuit board to the center of its rotation.

REAR PANEL CONNECTIONS

( ) Insert the LMO load into the LMO OUT phono socket.

( ) Connect an 8 Ω speaker to the SPEAKER phono socket.

NOTE: The Receiver was wired for operation from either a 120 Vac or 240 Vac power source. In the following steps, connect the Receiver to the ac power source for which it has been wired.

CAUTION: When the line cord plug is connected to an ac outlet, ac voltage will be present at several places under the chassis. Be careful that you do not contact this voltage or an electrical shock may result.

( ) Insert the female end of the power cord into the 120/240 Vac power socket. Plug the power cord into an ac power source.

PRELIMINARY ADJUSTMENTS

( ) Adjust your voltmeter to read +15 volts dc.

( ) Connect the voltmeter negative lead to the Receiver chassis assembly.

( ) Rotate the AF GAIN control to the 9 o'clock position.

( ) Turn the FUNCTION switch to OPR.

( ) Refer to Figure 6 and touch or connect the meter dc volts lead to lug 10 of the FUNCTION switch. This lug has an orange wire connected to it.

Refer to Figure 5 (fold-out from Page 110) for the location of internal controls in the following steps.

( ) Adjust the +15 ADJ control for +15 Vdc.

( ) Refer to Figure 7 and position the meter dc volts lead against the AGC connector on the RF Amplifier Switch-Board.

( ) Adjust the BIAS ADJ control for +3.5 Vdc.

( ) Disconnect the voltmeter test leads and temporarily set them aside.

( ) Adjust the METER ZERO control for a zero S-meter reading.

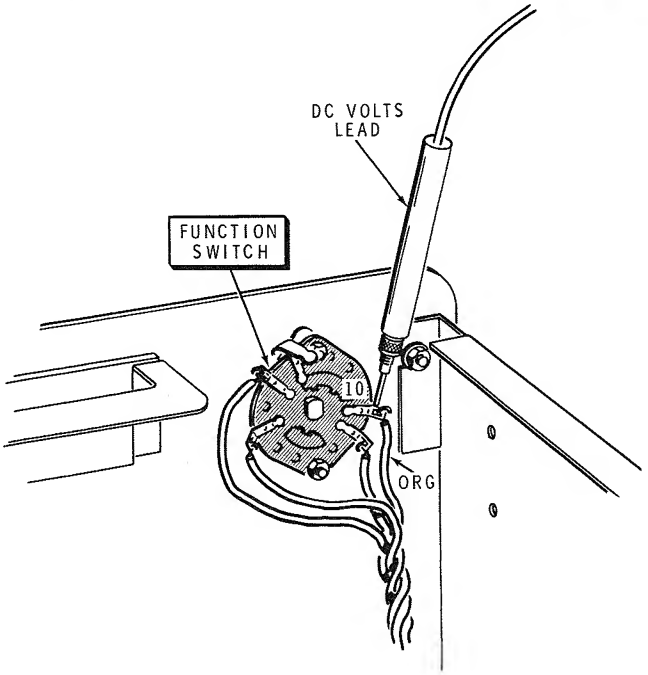


Figure 6

( ) Rotate the RF GAIN control fully counterclockwise.

( ) Adjust the METER FS (full scale) control until the S-meter needle just "pegs."

( ) Rotate the RF GAIN control fully clockwise.

( ) Turn the FUNCTION switch to the STBY position.

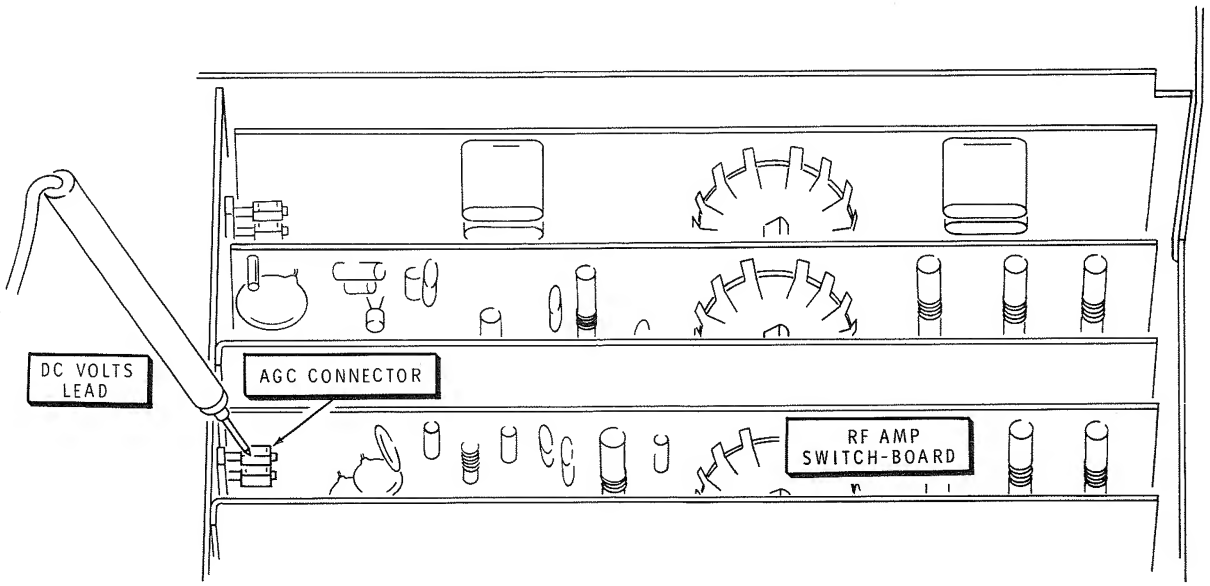


Figure 7

HETERODYNE OSCILLATOR ALIGNMENT

If you have a Heath Model SB-400 or SB-401 Transmitter and plan to use it with this Receiver for transceive operation, perform the following four steps. Otherwise, disregard the following four steps. If at any time in the future you plan to transceive with one of these transmitters, you should perform the following "Heterodyne Oscillator Alignment."

( ) 1. Position the Receiver and your transmitter as shown in Figure 8.

( ) 2. Connect a previously prepared 24" length of RG-62U (large) coaxial cable from the HFO OUT phono socket on the Receiver rear panel to the HET. OSC. phono socket on the transmitter rear panel.

( ) 3. Turn the transmitter function switch to the transceive position, turn the transmitter mode switch to the USB position, and set the main tuning to 0.00.

( ) 4. At all times, keep the transmitter band switch in the same position as the Receiver BAND switch. NOTE: When the Receiver BAND switch is in the 15.0 position, place the transmitter band switch in the 14.0 position.

( ) Adjust your voltmeter to read +5 volts dc.

( ) Connect the voltmeter common lead to the Receiver chassis assembly.

( ) Turn the FUNCTION switch to OPR.

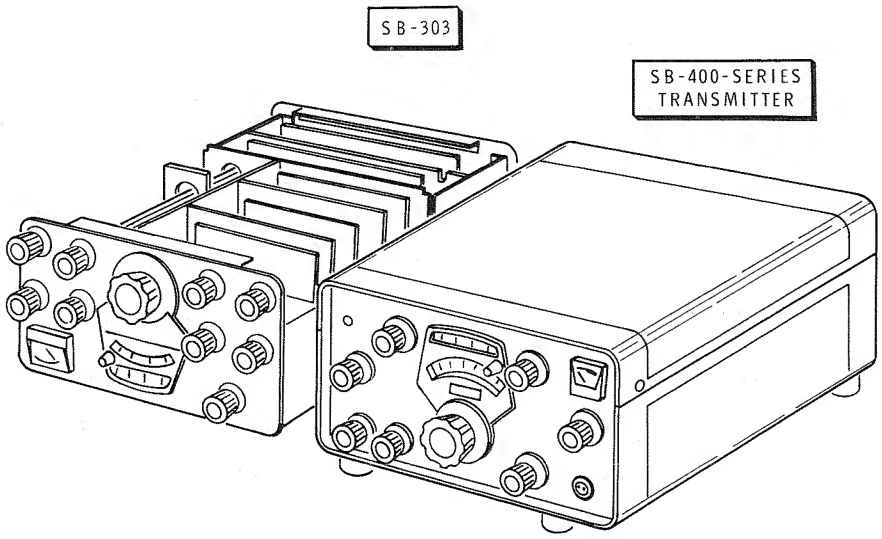


Figure 8

Refer to Figure 9 and the chart on Page 115 for the following steps.

( ) Position the meter dc volts lead against the TP connector pin on the heterodyne oscillator Switch-Board.

The coils on the heterodyne oscillator Switch-Board will be adjusted in the following chart. Rotate each coil slug slightly clockwise and/or counterclockwise to obtain a peak meter reading. Then rotate the coil slug either clockwise (CW) or counterclockwise (CCW) as indicated to obtain a voltage decrease in the meter reading. Use the long end of the small plastic alignment tool in these adjustments.

NOTE: Four of the coils that will be adjusted have two coil slugs. To reach the second slug, carefully slide the alignment tool through the hole in the first slug as shown in Figure 10. Be careful not to rotate the first slug when adjusting the second slug.

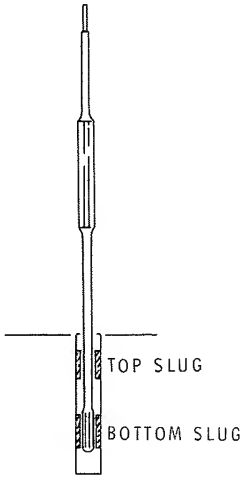


Figure 10

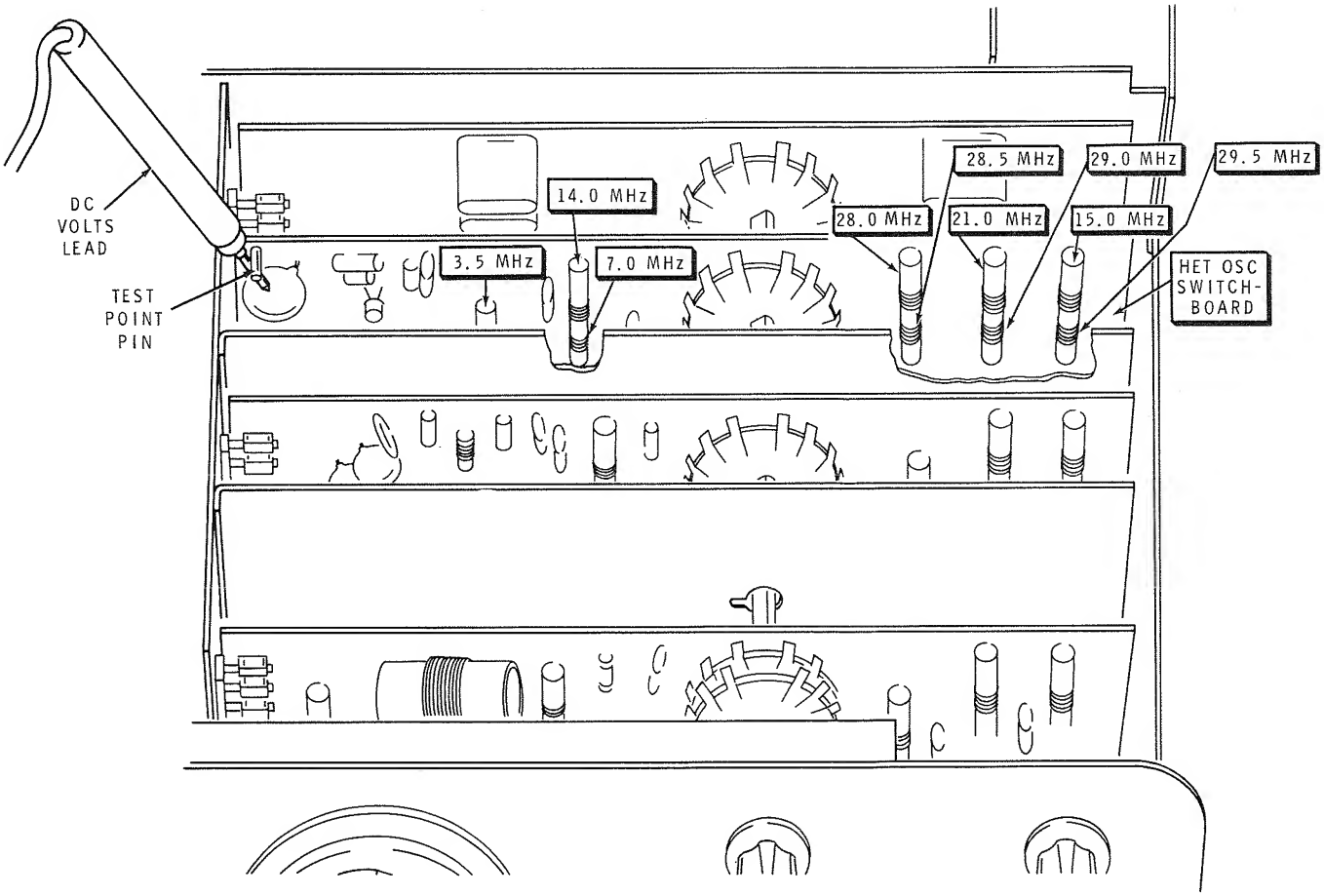


Figure 9

Complete the following adjustments:

BAND SWITCH POSITION AND HET OSC COIL	ROTATE SLUG FOR PEAK VOLTAGE. THEN ROTATE SLUG FOR AMOUNT OF VOLTAGE DECREASE SHOWN IN CHART.
3.5, L114	Clockwise, 0.5 V
7.0, L115	Counterclockwise, 0.5 V
14.0, L116	Clockwise, 0.3 V
15.0, L117	Clockwise, 0.3 V
21.0, L118	Clockwise, 0.1 V
28.0, L119	Clockwise, 0.1 V
28.5, L121	Counterclockwise, 0.1 V
29.0, L122	Counterclockwise, 0.1 V
29.5, L123	Counterclockwise, 0.1 V

EXAMPLE: 3.5 MHz – Peak to approximately 3.8 V. Turn slug clockwise for a .5 V decrease to 3.3 V.

( ) Turn the FUNCTION switch to STBY.

( ) Disconnect the voltmeter test leads and temporarily set them aside.

CRYSTAL CALIBRATOR ALIGNMENT

The crystal calibrator circuit is provided to enable you to accurately calibrate (adjust) your tuning dial every 100 kHz and every 25 kHz. Two methods of accurately adjusting this circuit are given in this section: "Calibration to WWV," and "Calibration Using Another Receiver." The WWV method is preferred.

CALIBRATION TO WWV

( ) Connect an antenna to the HF antenna phono socket on the Receiver rear panel.

( ) Set the front panel controls and switches to the following positions:

FUNCTION – STBY
CONVERTER – HF
PRESELECTOR – Any
R.F. ATTEN – Fully clockwise
BAND – 15.0
MAIN TUNING – 0.00
AGC – FAST
RF GAIN – Fully clockwise and pushed in
MODE – USB
AF GAIN – 9 o'clock position

NOTE: For further information on station WWV, refer to a current copy of "The Radio Amateur's Handbook."

When the FUNCTION switch is in the 100 kHz position, you should be able to hear a harmonic (multiple) of the calibration oscillator at every 100 kHz dial marking. In the 25 kHz position, you should be able to hear a harmonic (multiple) of the calibration oscillator every 25 kHz dial marking.

( ) Turn the FUNCTION switch to OPR.

( ) Rotate the PRESELECTOR for maximum noise or signal.

( ) Rotate the MAIN TUNING knob back and forth. Station WWV should be heard very close to the "0" mark on the circular dial (within 1 to 3 kHz).

( ) Turn the R.F. ATTEN control slowly all the way counterclockwise, then all the way clockwise. Signal strength should diminish, then return to its original loudness.

( ) Adjust the MAIN TUNING knob so that the zero-beat tone goes lower and lower in frequency and disappears.

( ) Turn the FUNCTION switch to 100 kHz. The tone from the calibrator should be heard. Refer to Figure 11 and adjust 100 kHz ADJ trimmer capacitor C606 on the power supply/BFO circuit board so the calibrator tone goes lower and lower in frequency and disappears. The calibration oscillator is now in zero beat with WWV.

( ) Turn the FUNCTION switch to OPR and then back to 100 kHz to be sure you have a true zero beat.

( ) When you have a zero beat, turn the FUNCTION switch to STBY.

( ) Disconnect the antenna from the Receiver.

( ) Turn the BAND switch to 3.5.

CALIBRATION USING ANOTHER RECEIVER

NOTE: Use this calibration procedure if you cannot receive WWV.

( ) Set the front panel controls and switches to the following positions:

FUNCTION – STBY
CONVERTER – HF
PRESELECTOR – Any
R.F. ATTEN– Fully clockwise
BAND – 3.5
MAIN TUNING – 0.00
AGC – FAST
RF GAIN – Fully clockwise and pushed in
MODE – USB
AF GAIN – 9 o'clock position

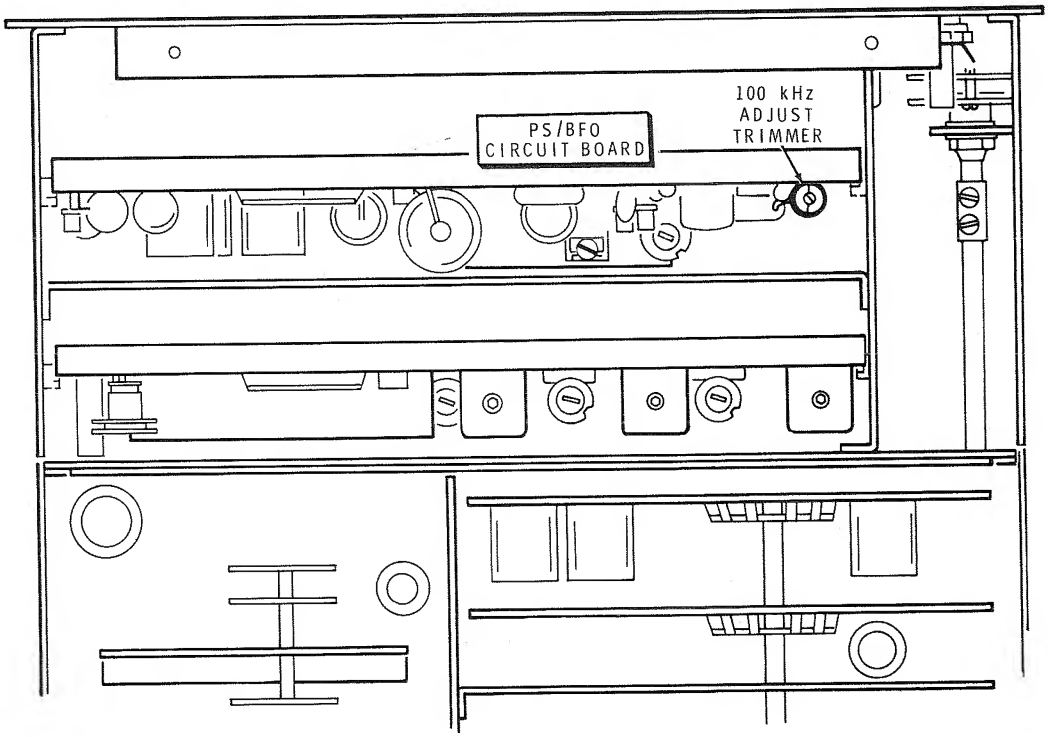


Figure 11

( ) Connect the SB-303 Receiver's HF antenna input to an antenna and antenna input of another receiver capable of receiving WWV at 2.5 MHz, 5 MHz, or 10 MHz. If this is not possible, a receiver tuned to a standard broadcast station, operating at an even multiple of 100 kHz or 25 kHz, can be used.

( ) Turn the SB-303 Receiver's FUNCTION switch to 100 kHz, and rotate the AF GAIN control fully counterclockwise, just to the point where it starts to click off.

( ) Tune the other receiver to WWV or a standard broadcast station as described.

( ) Refer to Figure 11 and adjust 100 kHz ADJ trimmer capacitor C606 on the SB-303 power supply/BFO circuit board until you hear the calibrator tone in the other receiver go lower and lower in frequency and disappear. NOTE: When WWV is used, the period when no tone modulation is present allows easier identification of the zero beat.

( ) Turn the SB-303 Receiver's FUNCTION switch to OPR and then back to 100 kHz to be sure you have a true zero beat.

( ) Turn the SB-303 Receiver's FUNCTION switch to STBY and disconnect the other receiver. The other receiver will no longer be needed.

LMO SHIFTER AND DIAL ADJUSTMENTS

LMO SHIFTER ADJUSTMENT

The purpose of this adjustment is to insure that the LMO remains at zero beat when it is shifted from one sideband to the other.

( ) Set the MAIN TUNING to 3.8 MHz.

( ) Turn the FUNCTION switch to 100 kHz.

( ) Adjust the MAIN TUNING for a loud calibrator tone.

( ) Rotate the PRESELECTOR for maximum S-meter reading.

( ) Alternately increase the AF GAIN control and adjust the MAIN TUNING until the calibrator tone goes lower and lower in frequency and disappears (zero beat).

( ) Rotate the AF GAIN control to a comfortable listening level.

( ) Turn the MODE switch to LSB. NOTE: Be very careful not to move the MAIN TUNING.

( ) The calibrator tone may or may not be heard. If the tone is not heard, turn the MODE switch back and forth between USB and LSB to be sure the tone is not heard (zero beat) in either switch position. If it is still not heard, proceed to the "Dial Calibration" section. If a tone is heard in either switch position, perform the remaining steps, and then proceed to the "Dial Calibration."

( ) Adjust the MAIN TUNING so the tone is not heard in the USB position of the MODE switch. Then turn the MODE switch to LSB.

( ) Refer to Figure 12 and adjust the LSB ADJUST coil on the LMO until the tone goes lower and lower in frequency and disappears. NOTE: It may be necessary to increase the AF GAIN control while adjusting the LSB ADJUST coil. This LSB ADJUST coil is adjusted with a small screwdriver through a hole in the RTTY circuit board.

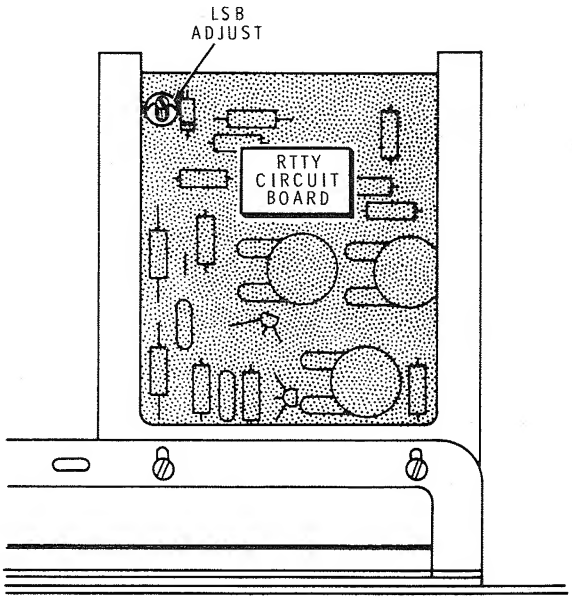


Figure 12

( ) Turn the MODE switch back and forth between USB and LSB to be sure the tone is not heard in either switch position. It may be necessary to repeat the previous step if a tone is heard.

( ) Rotate the AF GAIN control to the 9 o'clock position.

( ) Turn the MODE switch to USB.

DIAL CALIBRATION

( ) Remove the knob from the main tuning shaft.

( ) Zero beat the calibrator tone at 3.6 MHz.

( ) Set the adjustable index line in the center of the circular dial window.

Refer to Figure 13 for the following steps.

( ) Wrap the long portion of the long allen wrench with tape to avoid shorting it to the light sockets.

( ) Place a screwdriver through the hole in the dial escutcheon (located directly above the main tuning shaft) and into the LMO dial drive shaft.

( ) Hold the LMO drive shaft on zero beat and loosen the setscrew in the circular dial bushing. Turn the circular dial until the "0" is directly under the adjustable index line. Now tighten the setscrew.

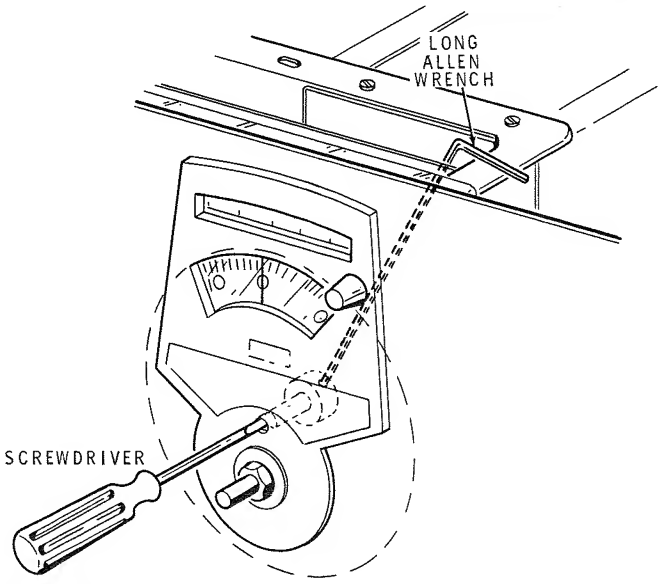


Figure 13

( ) Make sure the circular dial turns freely and the nylon spiral follower is properly engaged in the spiral before proceeding. It may be necessary to loosen and retighten the setscrew again.

( ) Turn the FUNCTION switch to STBY.

( ) Replace the knob on the main tuning shaft.

RF AND IF ALIGNMENT

NOTE: The remaining Receiver alignment can be performed with instruments or without instruments. Instrument alignment requires the use of an ac VTVM and an RF generator that can deliver a signal from 3.5 MHz to 30 MHz. If these instruments are available, proceed to "Instrument Alignment" on Page 121. Otherwise, proceed with "Alignment Without Instruments."

ALIGNMENT WITHOUT INSTRUMENTS

Alignment without instruments is accomplished by using the crystal calibrator as a signal source. No antenna is required.

( ) Set the MAIN TUNING to 3.5 MHz.

( ) Turn the FUNCTION switch to 100 kHz.

( ) AGC to Fast.

( ) R.F. ATTEN fully clockwise.

Refer to Figure 14 for preselector settings in the following steps. NOTE: The positions shown in the Figure are approximate reference points only.

( ) Set the PRESELECTOR to the 3.5 MHz position.

( ) Adjust the MAIN TUNING for a maximum S-meter reading.

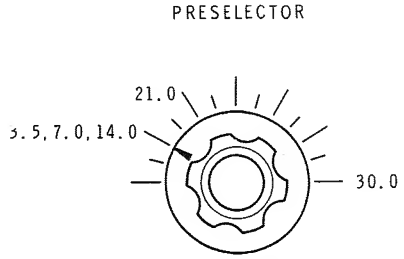


Figure 14

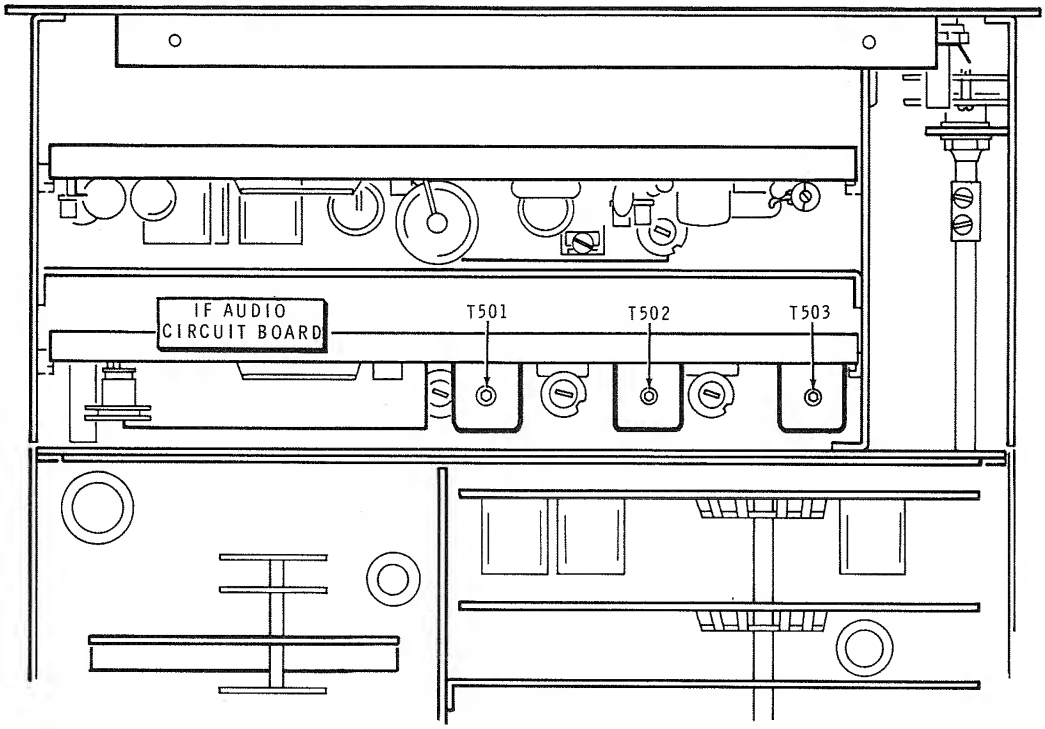


Figure 15

( ) Refer to Figure 15 and adjust IF transformers T501, T502, and T503 for a maximum S-meter reading with the large alignment tool.

( ) Refer to Figure 16 and adjust mixer coil L202 for a maximum S-meter reading.

( ) Readjust the three IF transformers for a maximum S-meter reading.

( ) Readjust coil L202 for a maximum S-meter reading.

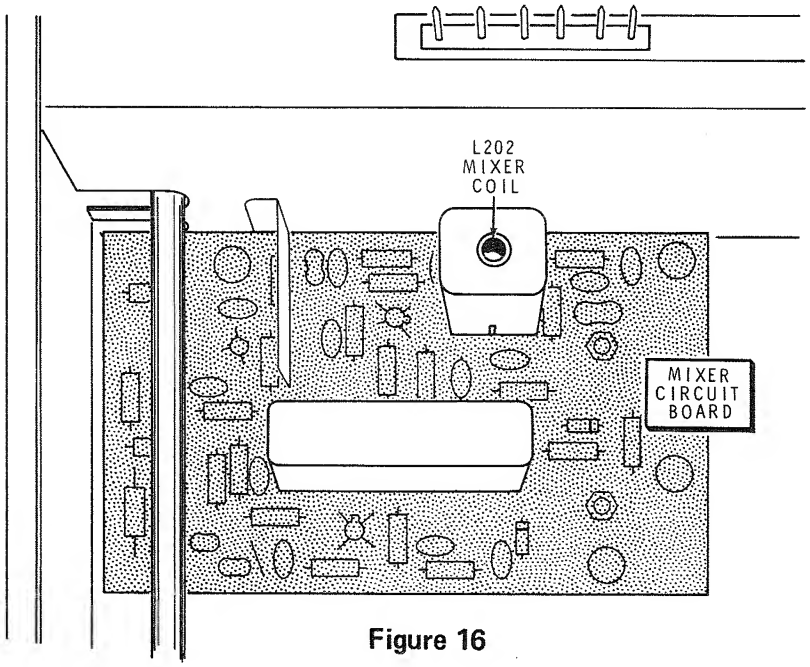


Figure 16

Refer to Figure 17 for the following steps.

NOTE: All antenna coils, referred to in the following steps, are on the antenna Switch-Board and all RF coils are on the RF amplifier Switch-Board. Use the small alignment tool.

( ) Adjust the 3.5 MHz antenna coil, L101, for a maximum S-meter reading.

( ) Adjust the 3.5 MHz RF amplifier coil, L108, for a maximum S-meter reading.

( ) Set the BAND switch to 7.0, and adjust the MAIN TUNING for a maximum S-meter reading. Leave the PRESELECTOR in the same position.

( ) Adjust the 7.0 MHz antenna coil, L102, for a maximum S-meter reading.

( ) Adjust the 7.0 MHz RF amplifier coil, L109, for a maximum S-meter reading.

( ) Set the BAND switch to 14.0, and adjust the MAIN TUNING for a maximum S-meter reading.

( ) Adjust the 14.0 MHz antenna coil, L103, for a maximum S-meter reading.

( ) Adjust the 14.0 MHz RF amplifier coil, L111, for a maximum meter reading.

( ) Set the BAND switch to 21.0.

( ) Set the MAIN TUNING to 21.0 MHz and then adjust the MAIN TUNING for a maximum S-meter reading.

( ) Set the PRESELECTOR to 21.0 MHz.

( ) Adjust the 21.0 MHz antenna coil, L104, for a maximum S-meter reading.

( ) Adjust the 21.0 MHz RF amplifier coil, L112, for a maximum S-meter reading.

( ) Set the BAND switch to 29.5, and rotate the MAIN TUNING to 29.9 MHz.

( ) Set the PRESELECTOR to the 30.0 MHz reference point.

( ) Adjust the 28.0 MHz antenna coil, L105, for a maximum S-meter reading.

( ) Adjust the 28.0 MHz RF amplifier coil, L113, for a maximum S-meter reading.

( ) Set the FUNCTION switch to STBY.

( ) Turn the AF GAIN to PWR. OFF.

This completes "Alignment Without Instruments."

If you have RTTY equipment, proceed with "FSK Alignment" on Page 124. Otherwise, proceed to "Final Assembly" on Page 127.

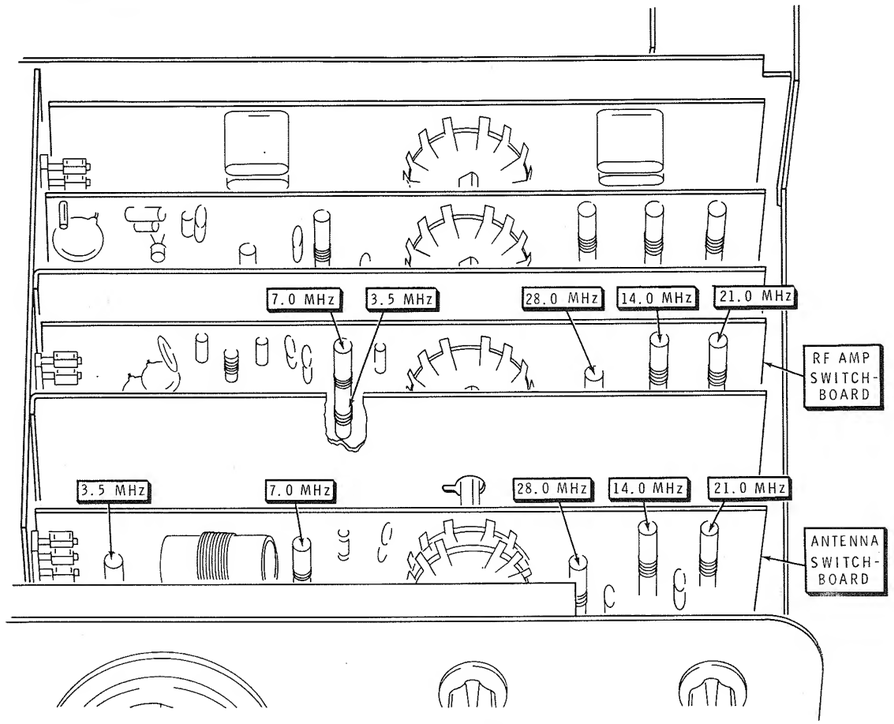


Figure 17

INSTRUMENT ALIGNMENT

Instrument Alignment is accomplished by using an RF signal generator and an ac VTVM. The generator must deliver a signal from 3.5 MHz to 30 MHz. No antenna is required for this alignment.

Refer to Figure 18 for the following steps.

( ) Plug in and turn on the generator and the ac VTVM. Allow both of them time to warm up before proceeding.

( ) Connect the ac VTVM test leads to the SPEAKER phono socket lugs on the Receiver rear panel.

( ) Connect the generator RF output leads to the HF ANT phono socket lugs on the Receiver rear panel.

( ) Turn the Receiver FUNCTION switch to OPR.

( ) Turn the R.F. ATTEN fully clockwise.

( ) Set the MAIN TUNING to exactly 3.5 MHz.

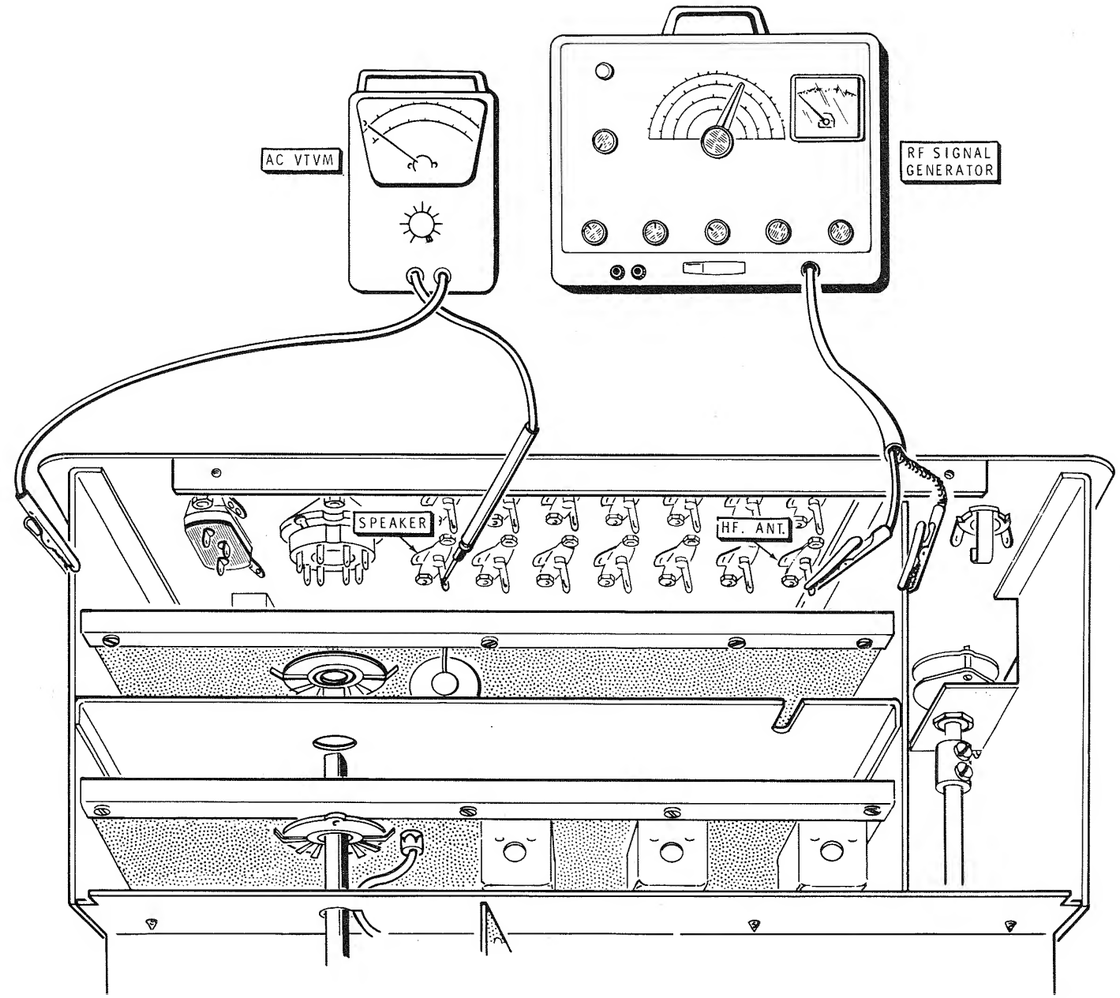


FIGURE 18

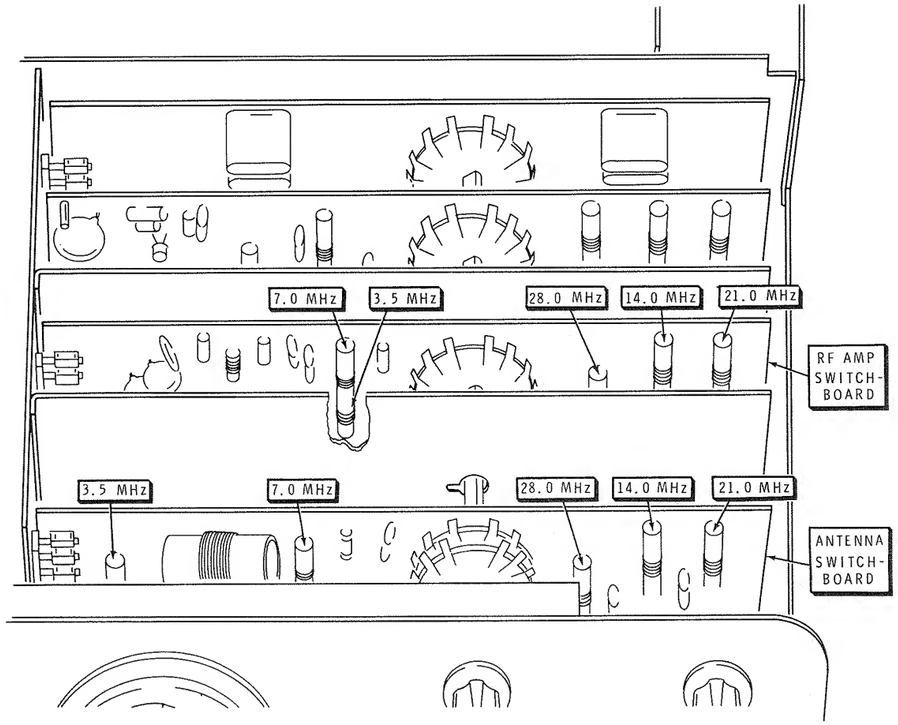


FIGURE 22

Refer to Figure 19 for PRESELECTOR settings in the following steps.

( ) Set the PRESELECTOR to the 3.5 MHz reference point.

NOTE: While performing the following steps, adjust the AF GAIN for a comfortable listening level and the ac VTVM range for a midscale meter reading.

( ) Tune the RF generator to approximately 3.5 MHz for a maximum ac VTVM meter reading. Decrease the generator amplitude until you have less than an "S-2" S-meter reading.

( ) Adjust the voltage range of the ac VTVM for a midscale reading.

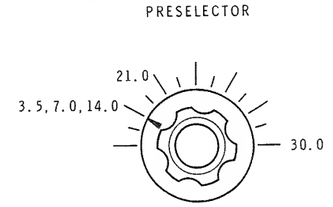


Figure 19

( ) Refer to Figure 20 and adjust IF transformers T501, T502, and T503 for a maximum meter reading.

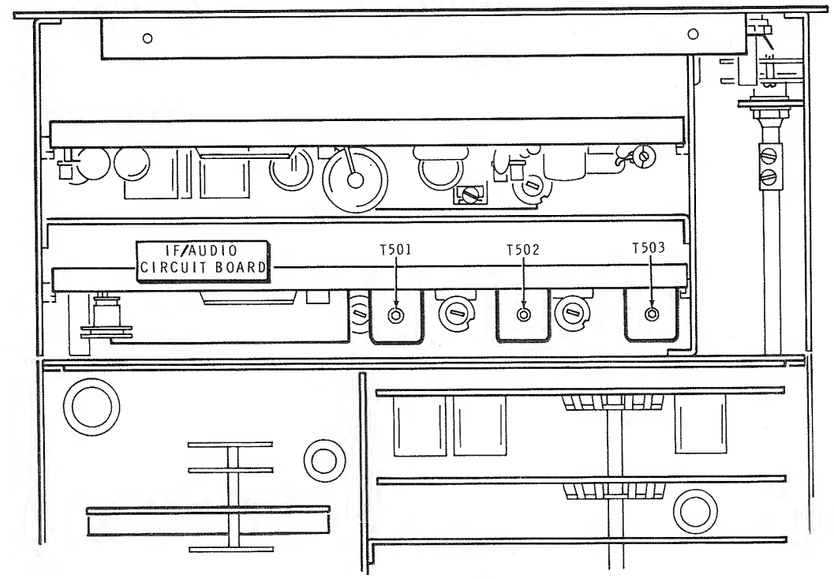


Figure 20

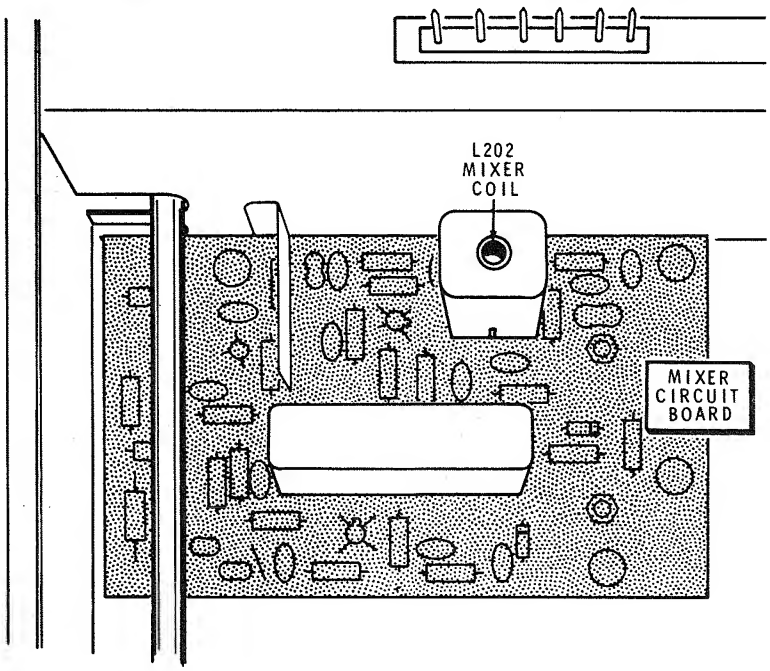


Figure 21

( ) Refer to Figure 21 and adjust mixer coil L202 for a maximum meter reading.

( ) Readjust the three IF transformers for a maximum meter reading.

( ) Readjust mixer coil L202 for a maximum meter reading.

Refer to Figure 22 (fold-out from Page 122) for the following steps.

NOTE: All antenna coils referred to in the following steps are on the antenna Switch-Board and all RF coils are on the RF amplifier Switch-Board.

Perform the following steps. Change the ac VTVM voltage range as required.

( ) Adjust the 3.5 MHz antenna coil. L101, for a maximum meter reading.

( ) Adjust the 3.5 MHz RF amplifier coil, L108, for a maximum meter reading.

( ) Set the BAND switch to 7.0. Set the PRESELECTOR to the 7.0 MHz reference point.

( ) Tune the generator to approximately 7.0 MHz for a maximum VTVM reading. Then decrease the generator amplitude until you have less than an "S-2" S-meter reading.

( ) Adjust the 7.0 MHz antenna coil, L102, for a maximum meter reading.

( ) Adjust the 7.0 MHz RF amplifier coil, L109, for a maximum meter reading.

( ) Set the BAND switch to 14.0

( ) Tune the generator to approximately 14.0 MHz for maximum VTVM reading. Then decrease the generator amplitude until you have less than an "S-2" S-meter reading.

( ) Set the PRESELECTOR to the 14.0 MHz reference point.

( ) Adjust the 14.0 MHz antenna coil, L103, for a maximum meter reading.

( ) Adjust the 14.0 MHz RF amplifier coil, L111, for a maximum meter reading.

( ) Set the BAND switch to 21.0.

( ) Set the MAIN TUNING to 21.00 MHz.

( ) Tune the generator to approximately 21.0 MHz for maximum VTVM reading. Then decrease the generator amplitude until you have less than an "S-2" S-meter reading.

( ) Set the PRESELECTOR to the 21.0 MHz reference point.

( ) Adjust the 21.0 MHz antenna coil, L104, for a maximum meter reading.

( ) Adjust the 21.0 MHz RF amplifier coil, L112, for a maximum meter reading.

( ) Set the BAND switch to 29.5.

( ) Set the MAIN TUNING to 29.9 MHz.

( ) Tune the generator to approximately 30.0 MHz for maximum VTVM reading. Then decrease the generator amplitude until you have less than an "S-2" S-meter reading.

( ) Set the PRESELECTOR to the 30.0 MHz reference point.

( ) Adjust the 28.0 MHz antenna coil, L105, for a maximum meter reading.

( ) Adjust the 28.0 MHz RF amplifier coil, L113, for a maximum meter reading.

( ) Set the FUNCTION switch to STBY.

( ) Turn the AF GAIN to PWR OFF.

This completes the "Instrument Alignment."

( ) Disconnect the ac VTVM test leads and the RF generator test leads from the Receiver.

If you have RTTY equipment, proceed with "FSK Alignment." Otherwise, proceed to "Final Assembly" on Page 127.

FSK ALIGNMENT

The FSK alignment uses an 850 Hz wide frequency shift, a 170 Hz narrow frequency shift, and a 50 Hz CW frequency shift. This same procedure can be used for FSK alignment using shift frequencies other than those stated.

PRESETTING CONTROLS

( ) Set the front panel controls and switches to the following positions:

FUNCTION – STBY
CONVERTER – HF
PRESELECTOR – Any
R.F. ATTEN – Fully clockwise
BAND – 3.5
MAIN TUNING – 3.6
AGC – FAST
RF GAIN – Fully clockwise and pushed in
MODE – RTTY
AF GAIN – 9 o'clock position

NOTE: The FSK alignment can be performed using an electronic counter or audio frequency meter, or a terminal unit and oscilloscope. If an electronic counter or audio frequency meter is available, proceed with "FSK Instrument Alignment." Otherwise, proceed with "FSK Terminal Unit Alignment."

FSK INSTRUMENT ALIGNMENT

( ) Connect an electronic counter or frequency meter to the SPEAKER phono socket.

CAUTION: 120 Vac or 240 Vac is present at the ac power socket and circuit breaker on the Receiver rear panel. Therefore, be very careful when installing and removing jumper wires in the following steps.

( ) Install a jumper wire from WIDE SHIFT lug 1 on the Accessory socket to chassis ground.

( ) Install a jumper wire from NARROW SHIFT lug 5 on the Accessory socket to chassis ground.

( ) Turn the FUNCTION switch to 100 kHz.

( ) Rotate the PRESELECTOR for a maximum S-meter reading.

( ) Adjust the MAIN TUNING for a 2975 Hz reading on the electronic counter or frequency meter.

( ) Remove the WIDE SHIFT jumper from the Accessory Socket.

( ) Adjust WIDE control R317 on the RTTY circuit board for a 2125 Hz reading.

( ) Replace the WIDE SHIFT jumper on the Accessory Socket.

NOTE: The electronic counter or frequency meter should again read 2975 Hz. If this reading is not obtained, repeat the four previous steps.

( ) Adjust the MAIN TUNING for a 2975 Hz reading.

( ) Remove the NARROW SHIFT jumper from the Accessory Socket.

( ) Adjust NARROW control R313 on the RTTY circuit board for a 2805 Hz reading.

( ) Replace the NARROW SHIFT jumper on the Accessory Socket.

NOTE: The electronic counter or frequency meter should again read 2975 Hz. If this reading is not obtained, repeat the four previous steps.

( ) Adjust the MAIN TUNING for a 2975 Hz reading.

( ) Install a jumper wire from CW SHIFT lug 7 on the Accessory Socket to chassis ground.

( ) Adjust CW control R308 on the RTTY circuit board for a 2925 Hz reading.

( ) Remove the CW SHIFT jumper wire from the Accessory Socket.

NOTE: The electronic counter or the frequency meter should again read 2975 Hz. If this reading is not obtained, repeat the four previous steps.

( ) Turn the FUNCTION switch to STBY.

( ) Remove the WIDE SHIFT jumper wire from the Accessory Socket.

( ) Remove the NARROW SHIFT jumper wire from the Accessory Socket.

This completes the "FSK Alignment."

Proceed to "Final Assembly" on Page 127.

FSK ALIGNMENT WITH TERMINAL UNIT

( ) Connect your terminal unit audio input to the Receiver's ANTI-VOX phono socket. Set the terminal unit for wide shift.

CAUTION: 120 Vac or 240 Vac is present at the ac power socket and circuit breaker on the Receiver rear panel; therefore, be very careful when installing and removing jumper wires in the following steps.

( ) Install a jumper wire from WIDE SHIFT lug 1 on the Accessory Socket to chassis ground.

( ) Install a jumper wire from NARROW SHIFT lug 5 on the Accessory Socket to chassis ground.

( ) Turn the FUNCTION switch to 100 kHz.

( ) Adjust the MAIN TUNING for a space ellipse on the oscilloscope.

( ) Remove the WIDE SHIFT jumper from the Accessory Socket.

( ) Adjust WIDE control R317 on the RTTY circuit board for an 850 Hz frequency shift (mark ellipse at 2125 Hz) on the oscilloscope.

( ) Replace the WIDE SHIFT jumper on the Accessory Socket.

NOTE: The oscilloscope should again display a space ellipse. If this display is not obtained, repeat the four previous steps.

( ) Adjust the terminal unit for a narrow shift.

( ) Adjust the MAIN TUNING for a space ellipse (2295 Hz) on the oscilloscope.

( ) Remove the NARROW SHIFT jumper from the Accessory Socket.

( ) Adjust NARROW control R313 on the RTTY circuit board for a 170 Hz frequency shift (mark ellipse at 2125 Hz) on the oscilloscope.

( ) Replace the NARROW SHIFT jumper on the Accessory Socket.

NOTE: The oscilloscope should again display a space ellipse. If this display is not obtained, repeat the four previous steps.

( ) Adjust the MAIN TUNING for a space ellipse on the oscilloscope.

( ) Install a jumper wire from CW SHIFT lug 7 on the Accessory Socket to chassis ground.

( ) Adjust CW control R308 on the RTTY circuit board for an approximate 50 Hz frequency shift on the oscilloscope.

( ) Remove the CW SHIFT jumper wire from the Accessory Socket.

NOTE: The oscilloscope should again display a space ellipse. If this display is not obtained, repeat the four previous steps.

( ) Turn the FUNCTION switch to STBY.

( ) Remove the WIDE SHIFT jumper wire from the Accessory Socket.

( ) Remove the NARROW SHIFT jumper wire from the Accessory Socket.

This completes the "FSK Alignment."

Proceed to "Final Assembly."

FINAL ASSEMBLY

Before you perform the following steps, select the feet and mounting hardware you wish to use so the parts will be immediately available as you install the cabinet. The screws for the mounting feet will be inserted through the four holes in the cabinet bottom and screwed into the captive nuts in the flange of the chassis.

Refer to Pictorial 13-28 for the following steps.

( ) Place a book on a flat surface and balance the receiver chassis on the book, front panel up.

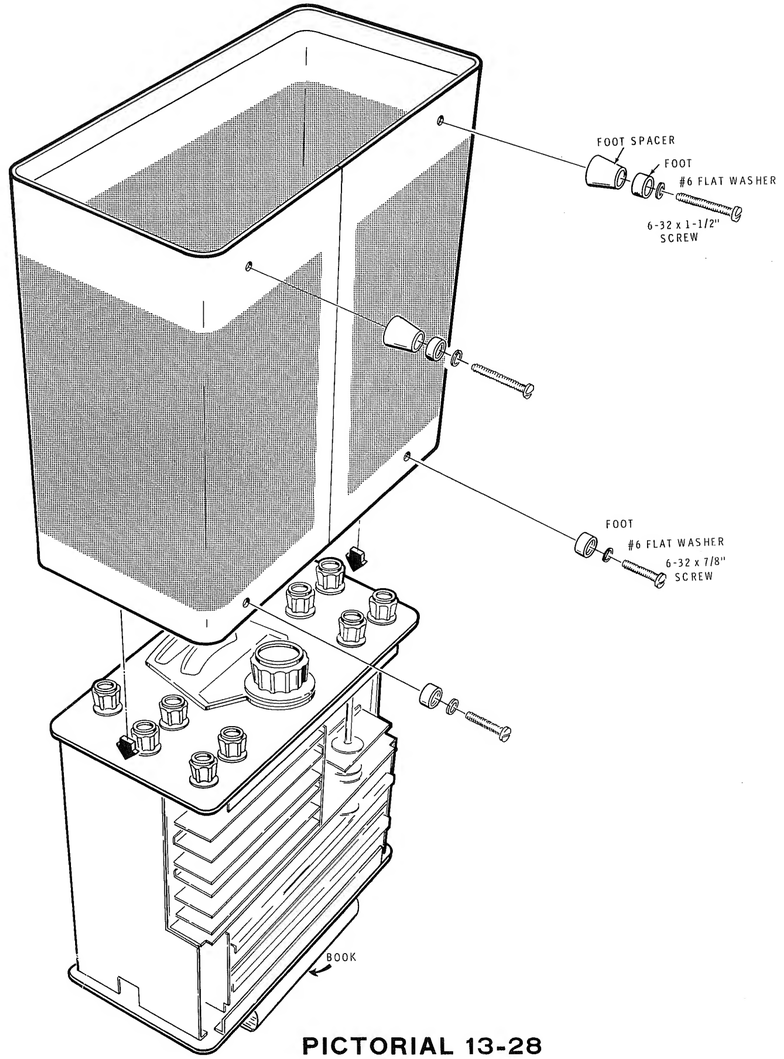
( ) Lower the cabinet onto the chassis so the captive nuts in the chassis bottom flange are aligned with the four holes in the cabinet.

NOTE: If you wish to elevate the front of the Receiver, complete step A. If you wish to have the Receiver sit level, complete step B.

( ) A. Install a foot on each rear corner with 6-32 x 7/8" screws. Then, install a foot spacer and a foot at each front corner of the cabinet with 6-32 x 1-1/2" screws.

( ) B. Install a foot at each corner of the cabinet. Use 6-32 x 7/8" screws.

This completes the "Final Assembly" of your Receiver. Proceed to the "Installation" section of the Manual.



PICTORIAL 13-28

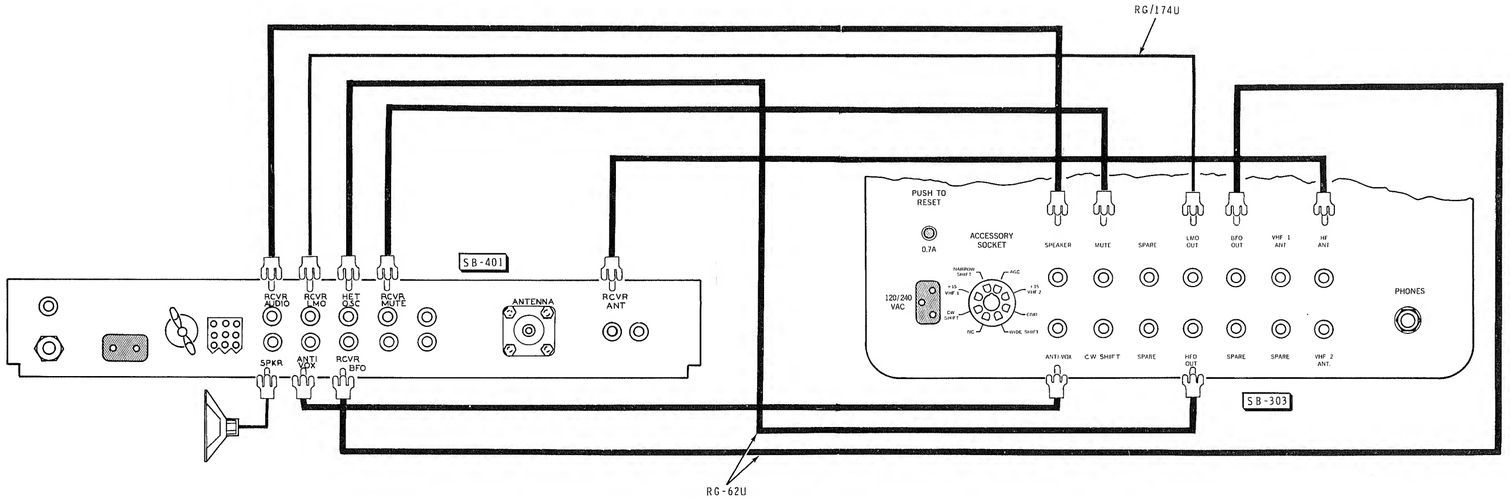


FIGURE 27

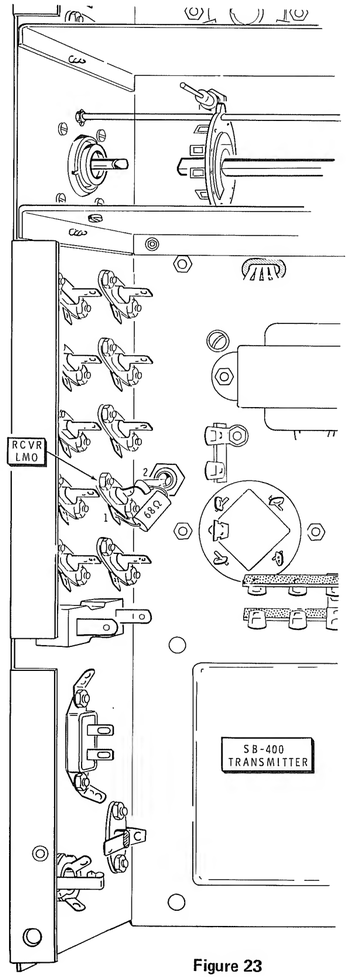


Figure 23

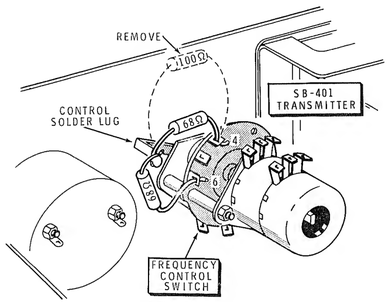


Figure 24

INSTALLATION

Although the Receiver operates well over a considerably wide temperature range, it will operate best with adequate air circulation.

To operate the Receiver with either the SB-400 or SB-401, complete one of the following transmitter modifications, depending on which transmitter you intend to use.

SB-400 MODIFICATION

( ) Unplug the line cord and disconnect all cables from your transmitter rear panel.

( ) Remove the transmitter from its cabinet.

( ) Locate the RCVR LMO phono socket on the rear panel. Refer to Figure 23 and connect a 68 Ω (blue-gray-black) resistor from lug 1 to lug 2. Solder both connections.

( ) Replace the cabinet, reconnect cables, and plug in the line cord.

Proceed to "Rear Panel Connections."

SB-401 MODIFICATION

Refer to Figure 24 for the following steps.

( ) Unplug the line cord and disconnect all cables from your transmitter rear panel.

( ) Remove the transmitter from its cabinet.

( ) Locate the 100 Ω (brown-black-brown) resistor on the front panel Frequency Control switch.

( ) Remove and discard this resistor.

( ) Connect a 68 Ω (blue-gray-black) resistor from lug 6 of the switch to the control solder lug. Solder both connections. Be sure the lead does not touch the switch spacer.

( ) Connect a 68 Ω (blue-gray-black) resistor from lug 4 of the switch to the control solder lug. Solder both connections.

Refer to Figure 25 for the following steps.

( ) Locate the mixer-bandpass circuit board (#85-154P335) and remove the 6EW6 tube, V4, along with the tube shield.

( ) Refer to the inset drawing of the Figure to unsolder and remove the 21 MHz trap coil (#40-479).

( ) Unsolder and remove the 180 pF capacitor.

( ) Unsolder, remove, and discard the 270 Ω (red-violet-brown) resistor and 100 pF capacitor combination. In its place install a 270 Ω (red-violet-brown) resistor. Solder both connections.

( ) Replace the 6EW6 tube, V4, and its shield.

( ) Replace the cabinet, reconnect cables, and plug in the line cord.

REAR PANEL CONNECTIONS

Refer to Figure 26 for an example of a station hookup and Figure 27 (fold-out from Page 128) for specific connections to either the SB-400 or SB-401.

HF ANT - The antenna input circuit is designed to accept a 50 Ω unbalanced antenna. The receiving antenna for signals in the 3.5 to 30 MHz amateur bands should be connected to this socket.

VHF 1 ANT and VHF 2 ANT - When a VHF converter is used, its output is connected to either of these input sockets. Either socket is switch selected by the CONVERTER switch. This switch may also be used as a receiver antenna switch for the selection of the different antennas.

MUTE – The Receiver will operate when the FUNCTION switch is in the STBY position and the muting cable is grounded. When the FUNCTION switch is in the OPERATE position, the muting line is grounded by the FUNCTION switch.

ANTI-VOX - The anti-vox is connected into the anti-vox jack on the transmitter to prevent the Receiver audio from tripping the transmitter VOX.

SPEAKER – The speaker socket is for an 8 Ω speaker.

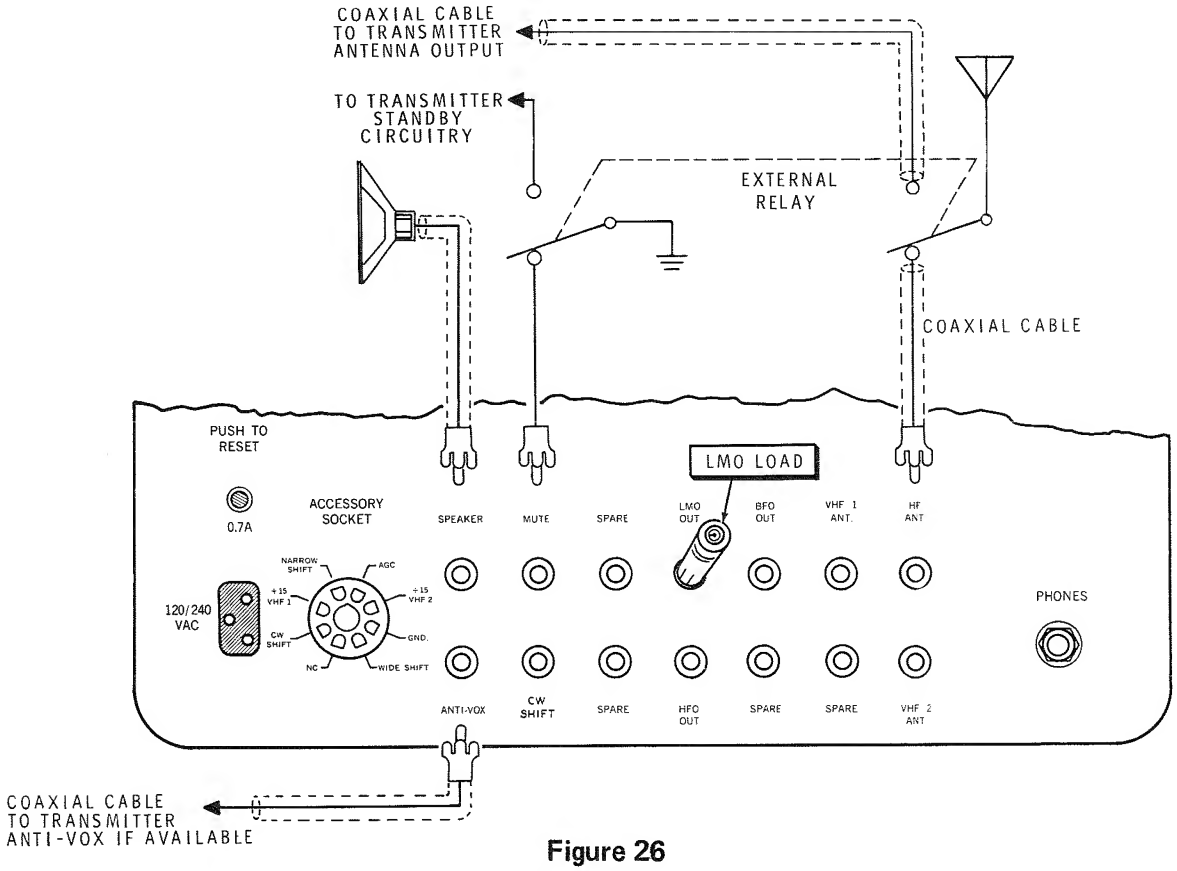


Figure 26

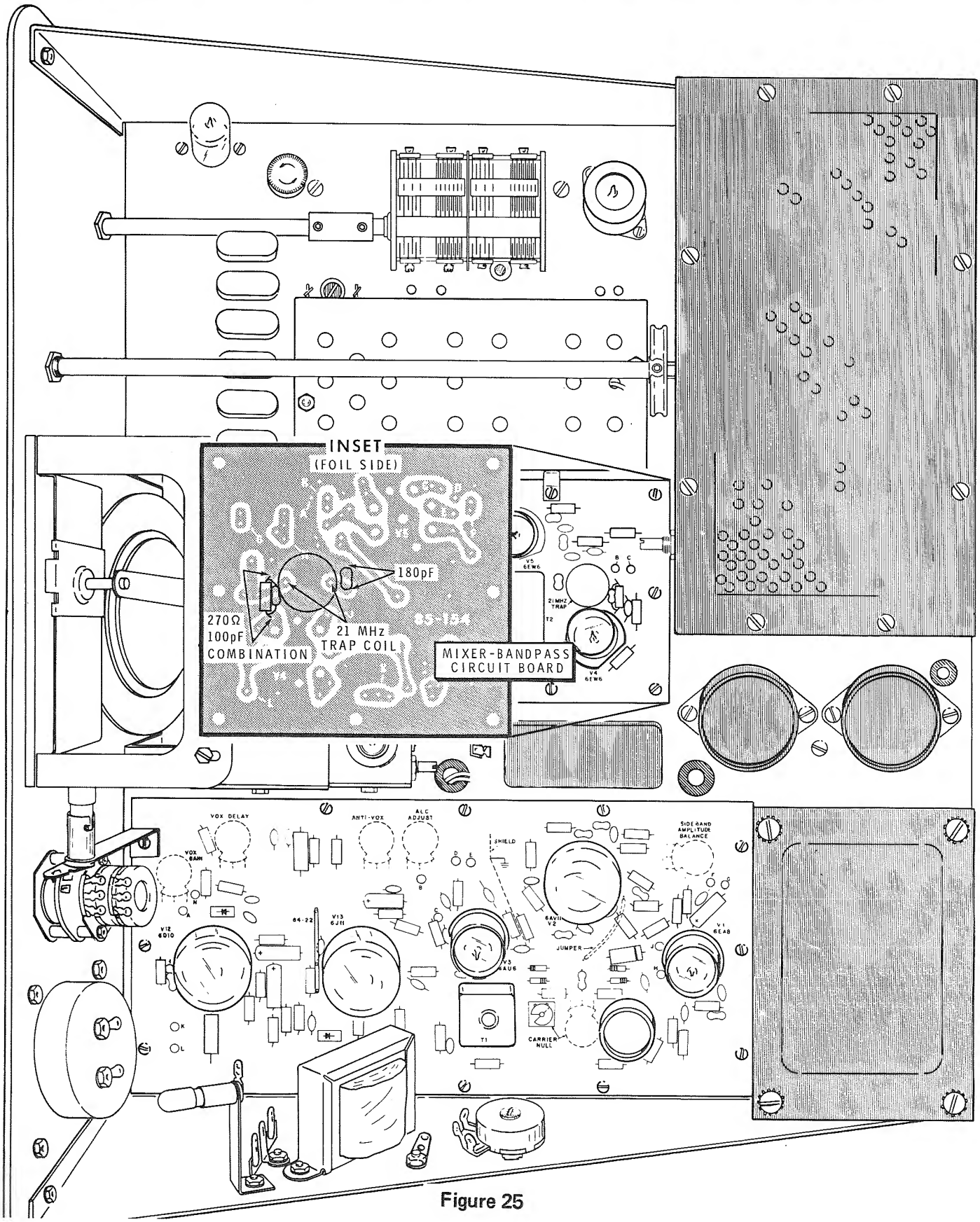

INSET
(FOIL SIDE)
180pF
270Ω
100pF
COMBINATION
21 MHz
TRAP COIL
MIXER-BANDPASS
CIRCUIT BOARD
VOX DELAY
ANTI-VOX
ALC ADJUST
SHIELD
SIDEBAND AMPLITUDE BALANCE
JUMPER
CARRIER NULL
T1
T2
V1 6EA8
V2 6AV11
V3 6AU6
V4 6EW6
V5 6EW6
V12 6D10
V13 6JH
21MHZ TRAP

Figure 25

LMO OUT – The LMO operating frequency is present at this socket for connection to the companion transmitter for transceive operation. Use the RG-174/U coaxial cable supplied. The LMO load must be connected to this socket when the transmitter is disconnected.

HFO OUT – The heterodyne oscillator output is available at this socket for connection to the companion transmitter for transceive operation. Use the RG-62/U coaxial cable supplied.

BFO OUT – The BFO output signal is present at this socket for connection to the companion transmitter for transceive operation. Use the RG-62/U coaxial cable supplied.

CW SHIFT – This socket provides for connection of a key for CW identification when operating RTTY equipment.

ACCESSORY SOCKET – B+ (regulated +15 Vdc at 25 mA maximum) voltages are present at this socket for operating a VHF converter. This voltage is applied to the appropriate converter by the CONVERTER switch. An AGC voltage is also available for connection to converters for gain control. The AGC voltage will range from +3.5 Vdc with no signal to -8.0 Vdc under muted conditions. The converter's AGC input should have a dc resistance greater than 10 MΩ. Wide shift, narrow shift, and CW shift connections function only when the MODE switch is in the RTTY position. Disregard these connections if you do not plan to operate RTTY equipment.

SPARE – There are four spare sockets for interconnection of accessory equipment.

OPERATION

Refer to Figure 28 for the location and complete explanation of the front panel controls.

The following steps apply to all five modes of operation. However, if either or both optional crystal filters (CW or AM) are not installed, switch to the USB or LSB mode. For satisfactory AM reception in USB or LSB mode, zero beat the AM carrier.

Complete the following steps.

1. Preset the controls as follows:

   FUNCTION – STBY
   CONVERTER – HF (unless using converter)
   PRESELECTOR – 12 o'clock
   R.F. ATTEN – Fully clockwise
   BAND – As desired
   AGC – Fast
   RF GAIN – Full clockwise
   SPEAKER DISABLE – In for speaker and phones, out for phones
   MODE – As required (NOTE: Calibrate in the USB mode; then switch to the desired mode. When operating in the CW mode, it may be easier to tune in the USB mode.)
   AF GAIN – 9 o'clock
   MAIN TUNING – As desired

NOTE: The following settings compensate for any heterodyne oscillator frequency variation from the exact frequency marked on the crystal.

2. Turn the FUNCTION switch to 25 kHz (use 100 kHz if the desired frequency is nearest an even 100 kHz) to obtain a calibrator signal.

3. Zero beat the Receiver to the calibrator signal.

4. Use the ZERO SET knob to place the zero set line directly over the 0, 25, 50, or 75 on the tuning dial.

5. Peak the PRESELECTOR for maximum S-meter reading.

6. Turn the FUNCTION switch to OPR.

7. Tune for a desired signal (except RTTY mode) while adjusting the AF GAIN control for the desired audio level. NOTE: In the RTTY mode, tune across the desired signal until both audio signals are balanced at the input of the terminal unit.

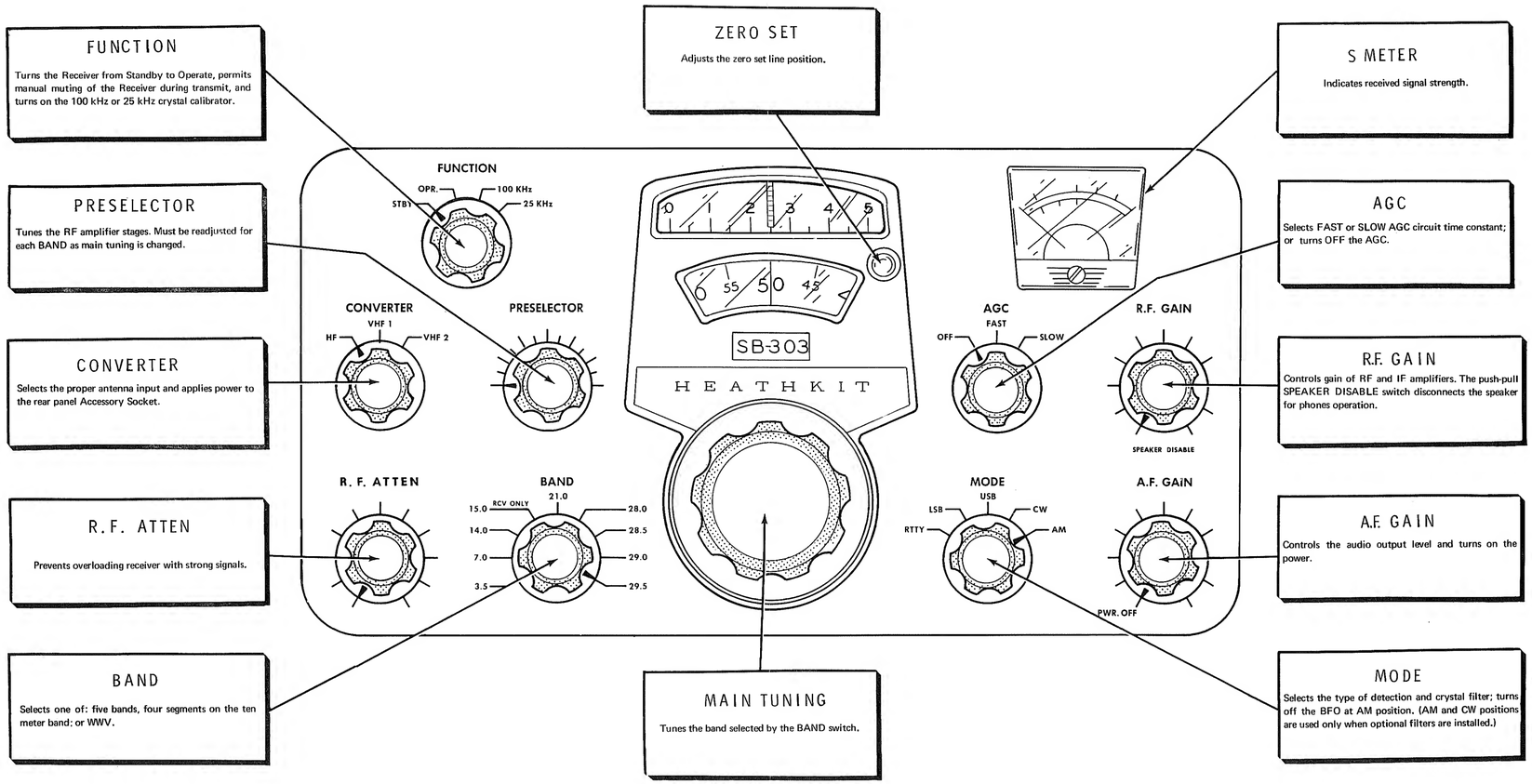


FIGURE 28

IN CASE OF DIFFICULTY

INTRODUCTION

This part of the Manual is intended to provide you with information that will help you locate and correct any difficulty which might occur in your Receiver. This information is divided into four sections. The first section contains suggestions of a general nature in the following areas:

A. Visual checks and inspection.

B. Precautions to observe when bench testing.

C. How to determine the area of the Receiver in which the trouble is located (How to Troubleshoot Your Receiver).

D. Locating and correcting both the cause and the effect of a trouble (Repairing the Receiver).

The second section contains information on how to install and use extender boards. An extender board can be used to extend a circuit board out of the chassis for troubleshooting.

The third section consists of troubleshooting charts. These charts call out specific problems that may occur and list one or more conditions or components that could cause each difficulty. The resistor R numbers, capacitor C numbers, coil L numbers, transformer T numbers, and the test point numbers, are identified in these charts by the same numbers that are used on the circuit board diagrams and the Schematic Diagram. X-ray views are also provided to help you locate the components and test points.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Service" section and Warranty of the "Kit Builders Guide" and to the "Factory Repair Service" information on Page 136 of this Manual.

GENERAL

VISUAL CHECKS

1. About 90% of the kits that are returned for repair, do not function properly due to poor soldering. Therefore, many troubles can be eliminated by a careful instection of connections to make sure they are soldered as described in the Soldering section of the "Kit Builders Guide." Reheat any doubtful connections and be sure all the wires are soldered at places where several wires are connected. Check carefully for solder bridges between circuit board foils.

2. Check to be sure that all transistors are in their proper locations, and are installed correctly.

3. Check the value of each part. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and as called out in the wiring instructions. It would be easy, for example, to install a 2200 Ω (red-red-red) resistor in a step that calls for a 220 Ω (red-red-brown) resistor.

4. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.

5. Check all component leads connected to the circuit boards. Make sure the leads do not extend through the circuit board and make contact with other connections or parts, such as shields or the chassis.

6. Check all of the wires that are connected to the Switch-Board and circuit board plugs to be sure the wires do not touch the chassis or other lugs. Make sure all wires are properly soldered.

7. If the difficulty still is not cured, read the "Precautions for Bench Testing" section, and the section titled "How to Troubleshoot Your Receiver."

PRECAUTIONS FOR BENCH TESTING

NOTE: Use an 11 megohm input impedance VTVM for voltage measurements.

1. Be cautious when testing transistor circuits. Although transistors have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage or current than tubes.
2. Be sure you do not short any terminals to ground when making voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it is almost certain to cause damage to one or more transistors or diodes.
3. Do not remove components while the Receiver is turned on, since this could damage the Receiver.
4. Do not remove Switch-Boards or circuit boards while the Receiver is turned on.
5. The Receiver can be turned on after a Switch-Board or circuit board is removed.

CAUTION: The full ac line voltage is present at several points (circuit breaker, ac socket, PWR Off/On switch, etc.) in the power supply circuit of the Receiver. Be careful to avoid personal shock when performing the checks described.

HOW TO TROUBLESHOOT YOUR RECEIVER

Go directly to the Troubleshooting Charts to see if the difficulty you are having is listed in one of the "Symptom" columns. If your difficulty is listed there, check the "Possible Causes" listed for that item and apply the Visual Checks listed to the Area of Difficulty.

REPAIRING THE RECEIVER

When you make repairs to your Receiver, make sure you eliminate the cause as well as the effect of the trouble. If, for example, you should find a damaged resistor, be sure you find out what (wiring error, etc.) caused the resistor to become damaged. If the cause is not eliminated, the replacement resistor may also become damaged when the Receiver is put back into operation.

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heathkit Electronic Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heathkit Electronic Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heathkit Electronic Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan.

Check the equipment to see that all parts and screws are in place. (Do not include wooden cabinets when shipping receivers, tuners, amplifiers, or TV sets, as these are easily damaged in shipment.) Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least THREE INCHES of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

EXTENDER BOARDS

Two extender boards are supplied with this Kit. These boards provide a means of extending a Switch-Board or circuit board out of the chassis for making voltage or resistance measurements. The small extender board is used with the antenna, heterodyne oscillator, RF Amplifier, and crystal Switch-Boards. The large extender board is used with the IF/audio and power supply/BFO circuit boards. For installation instructions, refer to the following information under the appropriate heading.

CAUTION: Disconnect the line cord before extending a Switch-Board or circuit board. Reconnect the line cord while the board is extended, or after it is reinstalled.

SMALL EXTENDER BOARD INSTALLATION

Refer to Figure 29 for the following steps.

1. Position the Receiver up-side-down with the front panel toward you.
2. Loosen the band switch shaft collar. Then slide the band switch shaft out far enough to clear the Switch-Board you wish to extend.
3. Disconnect any coaxial cables or wires connected to the Switch-Board. Coaxial cables and wires must remain disconnected throughout extended board operation.
4. Remove the Switch-Board from the Receiver by sliding it away from the plug board.
5. Install the small extender board into the Receiver in place of the switch board with the foil side facing the rear of the Receiver.
6. Connect the Switch-Board to the end of the small extender board.

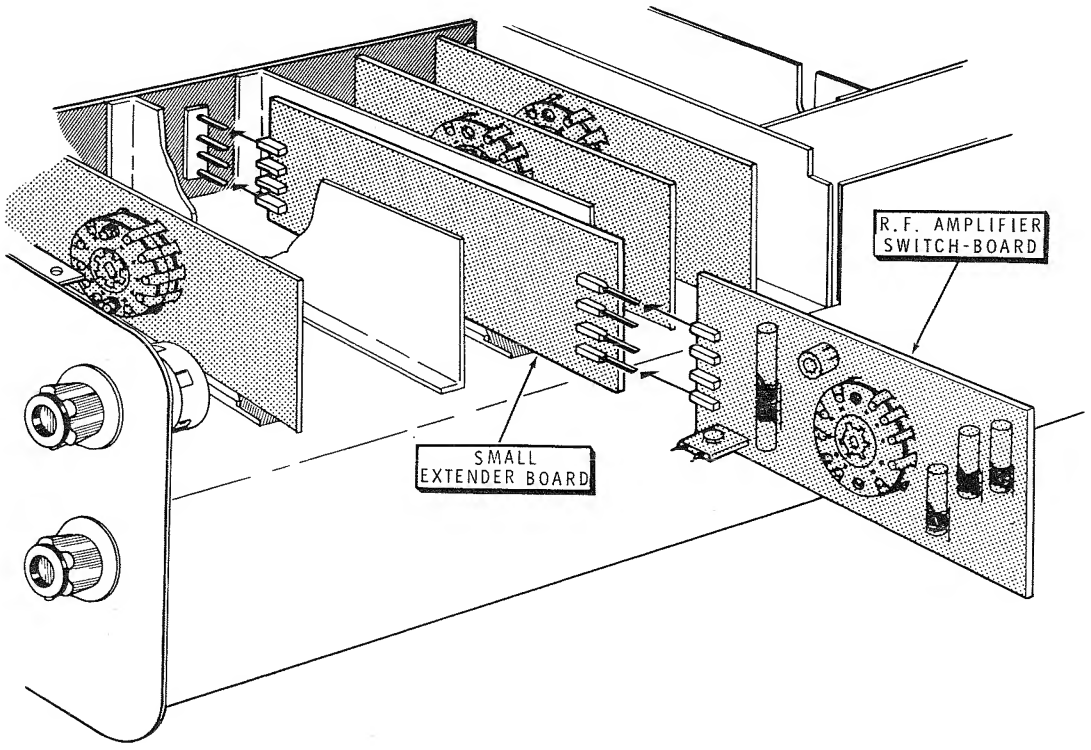


Figure 29

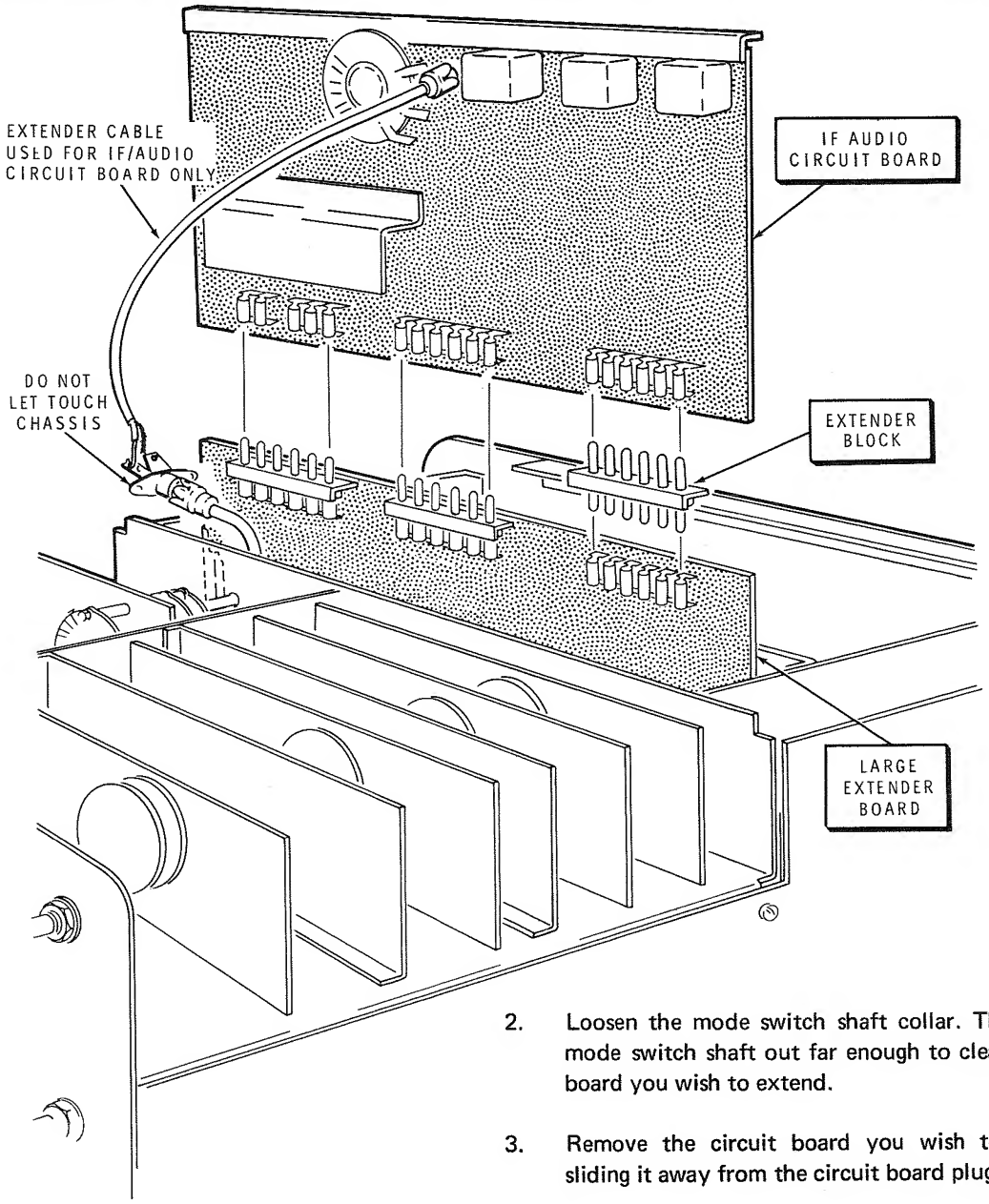


Figure 30

LARGE EXTENDER BOARD INSTALLATION

Refer to Figure 30 for the following steps.

NOTE: Either the IF/audio or the power supply/BFO circuit board can remain fully operational when extended.

1. Position the Receiver up-side-down with the front panel toward you.
2. Loosen the mode switch shaft collar. Then slide the mode switch shaft out far enough to clear the circuit board you wish to extend.
3. Remove the circuit board you wish to extend by sliding it away from the circuit board plugs.
4. The coaxial cables can remain connected throughout extended board operation. Use the extender cable for the IF IN coaxial cable when extending the IF/audio circuit board.
5. Install the large extender board into the Receiver in place of the circuit board with the foil side facing the rear of the Receiver.
6. Insert a 6-pin extender block into each group of circuit board connectors on the circuit board.
7. Install the extender board on the 6-pin extender blocks on the circuit board.

TROUBLESHOOTING

The Troubleshooting Charts on these pages list specific difficulties that could occur in your Receiver. Several psssible causes may be listed for each difficulty. The chassis has its own Troubleshooting Chart and Chassis Photographs. The chassis Troubleshooting Chart may direct you to a Switch-Board or circuit board troubleshooting chart if the cause of the trouble is not on the chassis.

Each Switch-Board and circuit board troubleshooting section has its own troubleshooting chart, X-ray views, resistance views, voltage views, and schematic. Refer to these to locate and identify parts listed in the charts.

NOTE: The following index lists the symptoms found in all of the troubleshooting charts. The page number or numbers after each symptom indicates pages on which the symptom and its possible causes will be found.

INDEX

CHASSIS

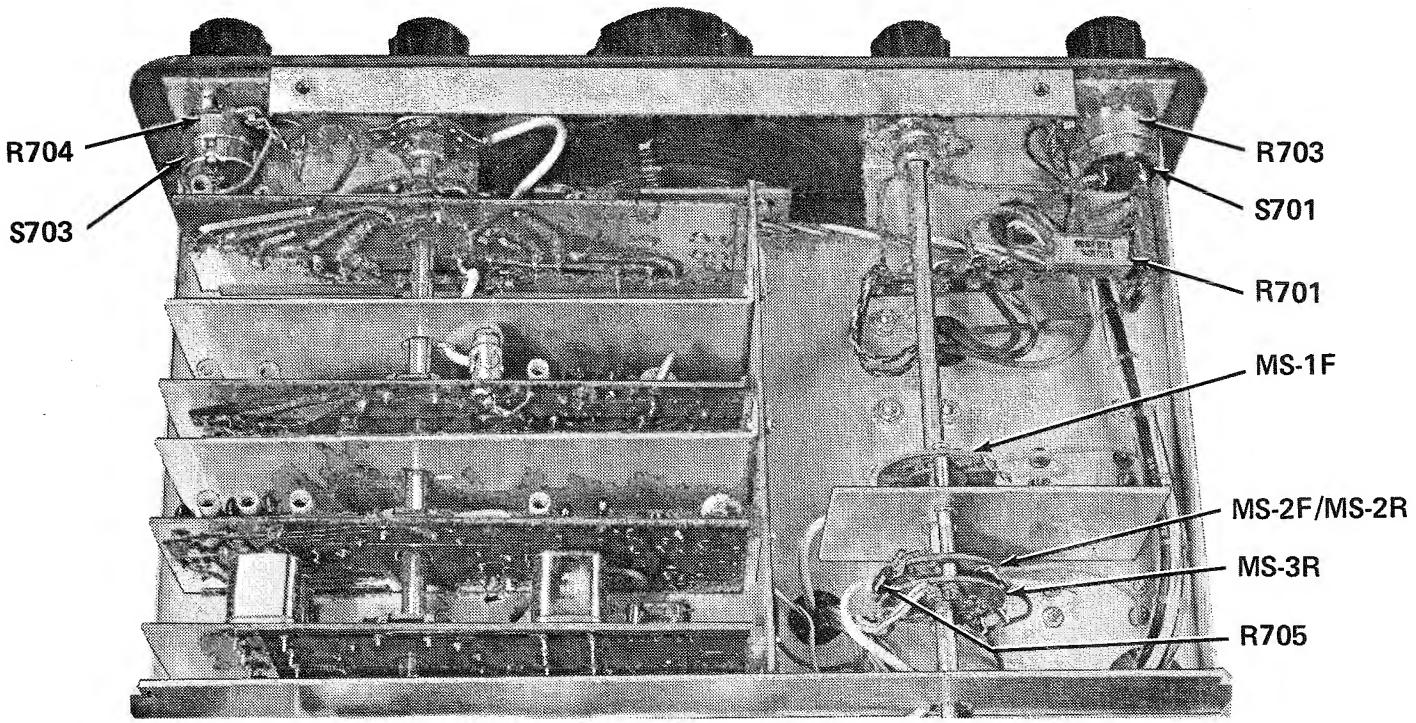
TROUBLESHOOTING CHART

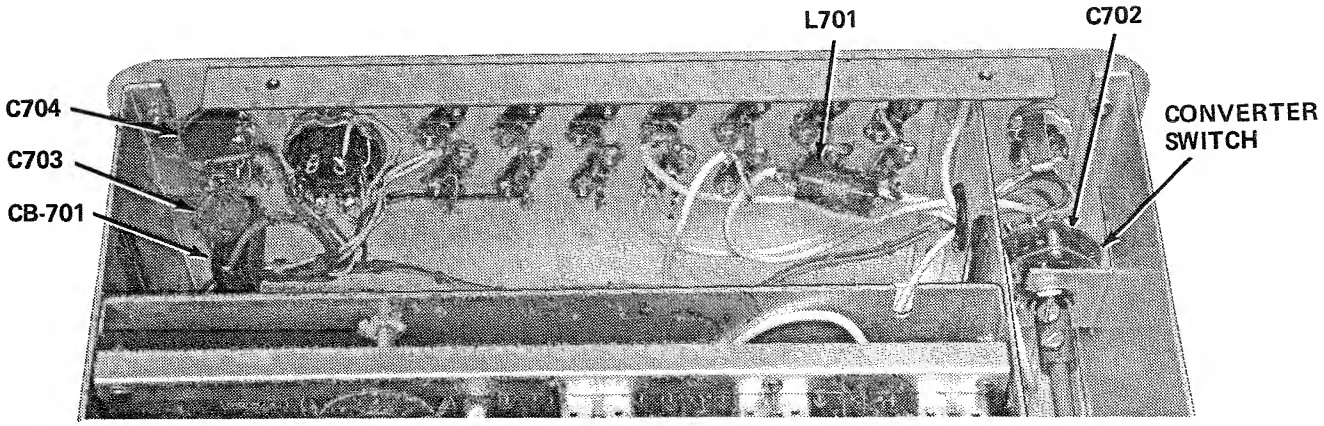
(Also see "Chassis Photographs," Pages 142, 143.)

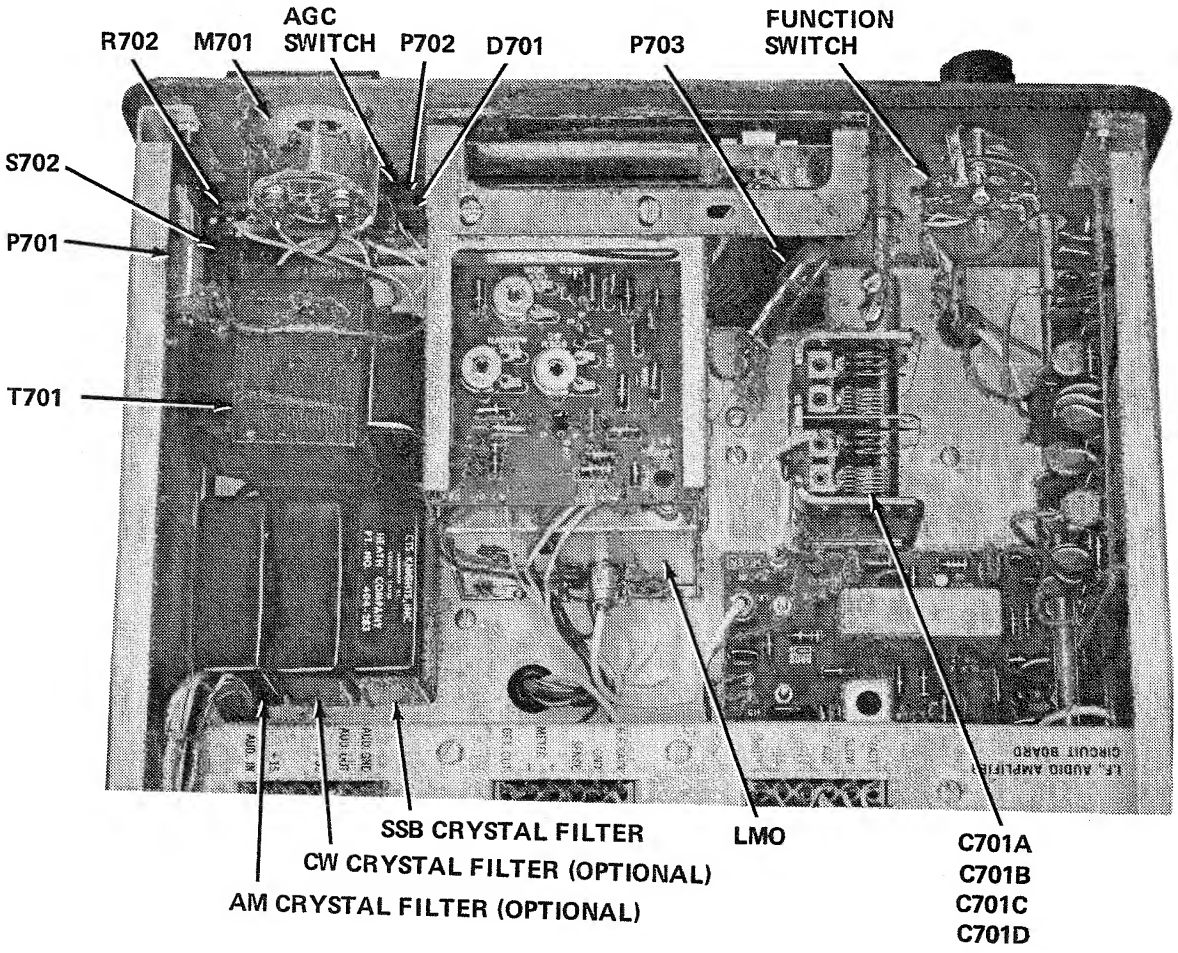
SYMPTOM	POSSIBLE CAUSE
Pilot lamps fail to light.	1. Circuit breaker open. 2. Capacitor C703 or C704. 3. PWR switch wired incorrectly or open. 4. Pilot lamps P701, P702, or P703 open (lamps are wired in series). 5. 5-lug terminal strip AY and/or 3-lug terminal strip AZ wired incorrectly.
No audio output.	1. Speaker not properly connected. 2. SPEAKER DISABLE switch pulled out. 3. AF GAIN control incorrectly wired or open. 4. Shielded cable connected incorrectly or shorted. 5. FUNCTION switch is in the STBY position. 6. Refer to the "IF/Audio Troubleshooting Chart."
No IF output.	1. FUNCTION switch is in the STBY position. 2. Refer to the "IF/Audio Troubleshooting Chart."
No output from crystal filters.	1. Switch rotor MS-1 or MS-2 of the MODE switch rotated 180 degrees from its correct position or incorrectly wired. 2. Resistor R705 incorrectly installed or open. 3. Coaxial cable from wafer MS-2 of the MODE switch wired incorrectly or shorted.
No output from the second mixer.	1. Coaxial cable from MODE switch wafer MS-1 wired incorrectly or shorted. 2. LMO incorrectly wired or inoperative. 3. Coaxial cable connected to LMO OUT jack wired incorrectly or shorted. 4. FUNCTION switch is in the STBY position. 5. Refer to the "Mixer Troubleshooting Chart."
No output from the first mixer.	1. Coaxial cable connected to HFO OUT jack improperly wired or shorted. 2. HFO not connected or inoperative. 3. FUNCTION switch is in the STBY position. 4. Refer to the "Mixer Troubleshooting Chart."

SYMPTOM	POSSIBLE CAUSE
HFO does not operate.	1. Coaxial cable connected to HFO jack on the rear panel, shorted. 2. Refer to the "Heterodyne Oscillator Troubleshooting Chart."
No output from the RF amplifier.	1. Connections not made to the antenna and RF amplifier Switch-Boards from preselector capacitor sections C701A, C701B, C701C, or C701D. 2. FUNCTION switch in STBY position. 3. Cable not connected to ANTENNA INPUT on the antenna Switch-Board. 4. Refer to the "Antenna Troubleshooting Chart."
AGC does not operate.	1. Diode D701 installed backward or shorted. 2. AGC switch wired incorrectly. 3. Refer to the "IF/Audio Troubleshooting Chart."
S meter does not operate.	1. Wires connected to S meter reversed. 2. S meter defective. 3. AGC switch OFF. 4. Refer to the "IF/Audio Troubleshooting Chart."
Calibrator does not operate.	1. FUNCTION switch wired incorrectly. 2. Capacitor C702 not installed. 3. Refer to the "Power Supply/BFO Troubleshooting Chart."
RTTY does not operate.	1. Switch wafer MS-3 of the MODE switch incorrectly wired or rotated 180 degrees from its correct position. 2. Accessory socket incorrectly wired. 3. Refer to the "RTTY Troubleshooting Chart."

CHASSIS PHOTOGRAPHS



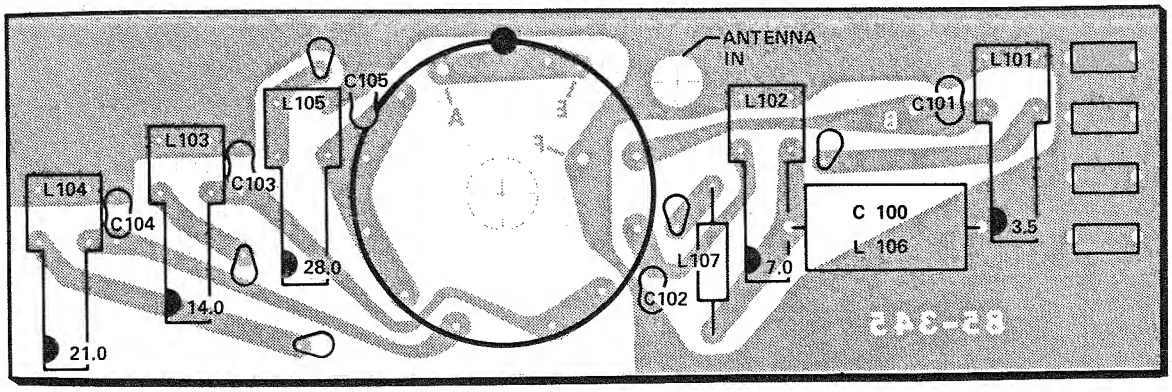



R702
M701
AGC SWITCH
P702
D701
P703
FUNCTION SWITCH
S702
P701
T701
SSB CRYSTAL FILTER
CW CRYSTAL FILTER (OPTIONAL)
AM CRYSTAL FILTER (OPTIONAL)
LMO
C701A
C701B
C701C
C701D

ANTENNA SWITCH-BOARD

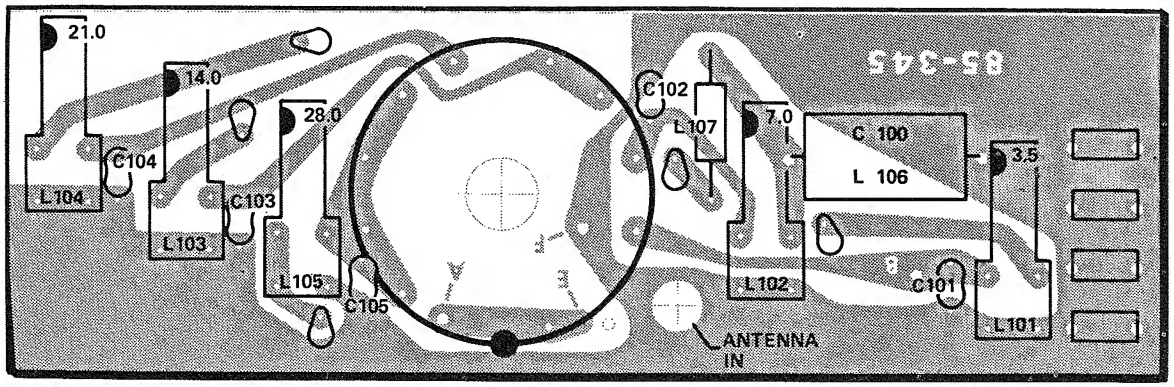
TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
No output from the RF amplifier.	1. Antenna coils incorrectly tuned. 2. Switch rotor BS-1 or BS-2 of the BAND switch rotated 180 degrees from their correct position. 3. Switch wafer BS-1 of the BAND switch wired incorrectly to the circuit board. 4. Coaxial cable shorted. 5. Refer to the "RF Amplifier Troubleshooting Chart."

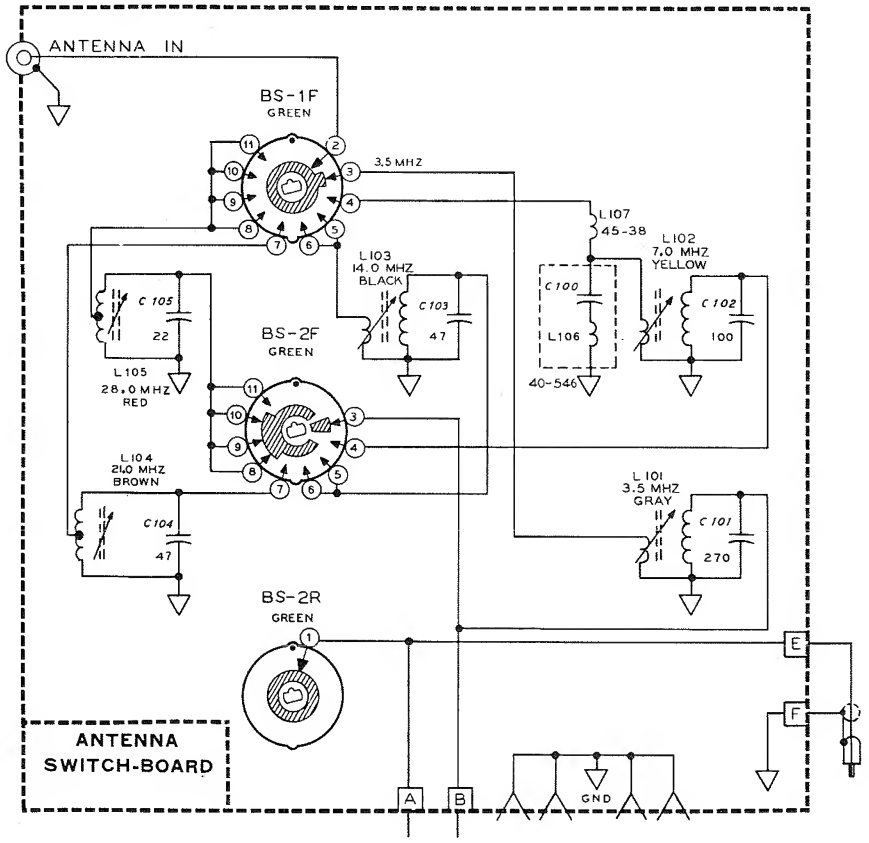


X-RAY VIEW

(SHOWN FROM COMPONENT SIDE)



X-RAY VIEW
(SHOWN FROM FOIL SIDE)



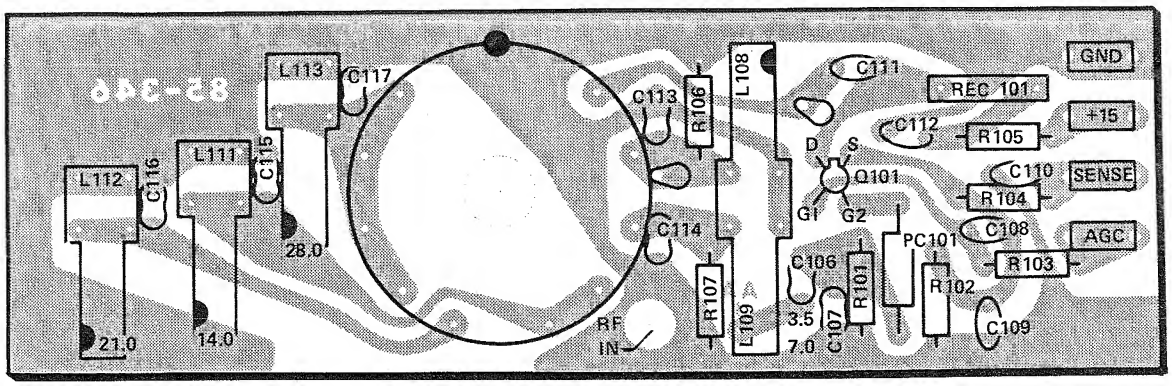
ANTENNA SWITCH-BOARD SCHEMATIC

RF AMPLIFIER SWITCH-BOARD

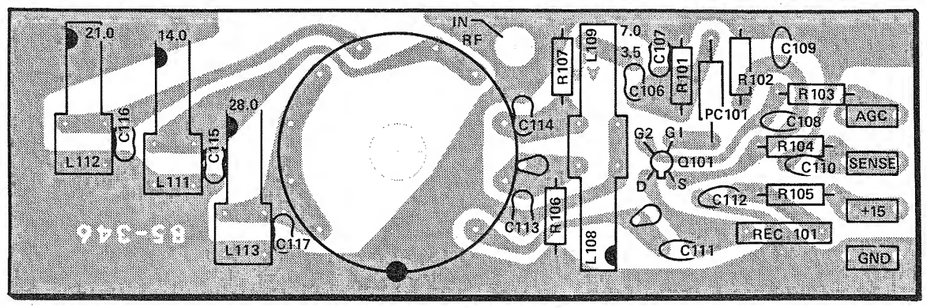
TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
No output from the RF amplifier.	1. RF amplifier coils incorrectly tuned. 2. Switch wafer BS-3 of the BAND switch tuned 180 degrees from its correct position. 3. Transistor Q101 incorrectly installed or shorted. 4. RF amplifier Switch-Board connectors not making contact with plug board connectors. 5. Choke RFC101 open. 6. Capacitor C108 or C109 open. 7. Capacitor C112 shorted. 8. Capacitor C111 open. 9. Refer to the "IF/Audio Troubleshooting Chart."
AGC does not operate.	1. Transistor Q101 incorrectly installed or shorted.
S meter does not operate.	1. Transistor Q101 incorrectly installed or shorted. 2. RF amplifier Switch-Board connectors not making contact with plug board connectors.

X-RAY VIEW

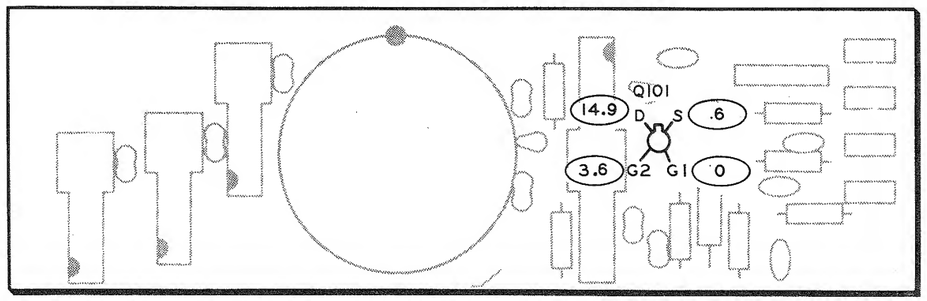


(SHOWN FROM COMPONENT SIDE)

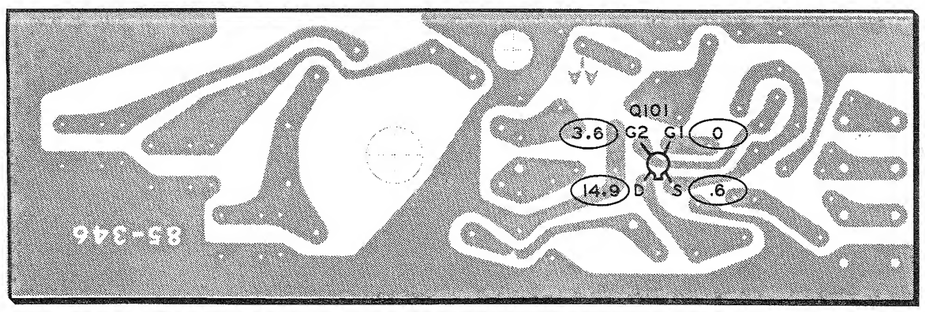


(SHOWN FROM FOIL SIDE)

VOLTAGE CHARTS

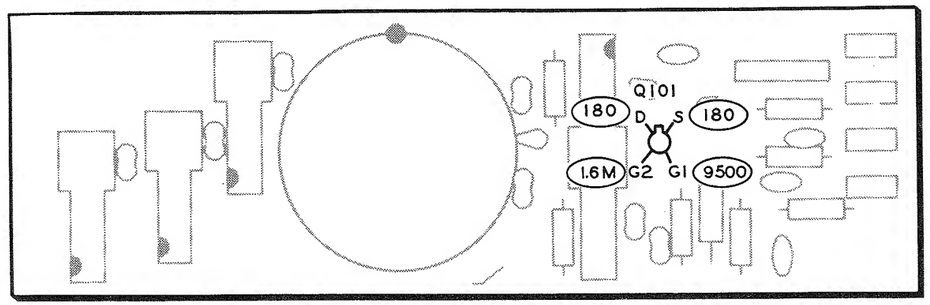


(SHOWN FROM COMPONENT SIDE)



(SHOWN FROM FOIL SIDE)

RESISTANCE CHARTS



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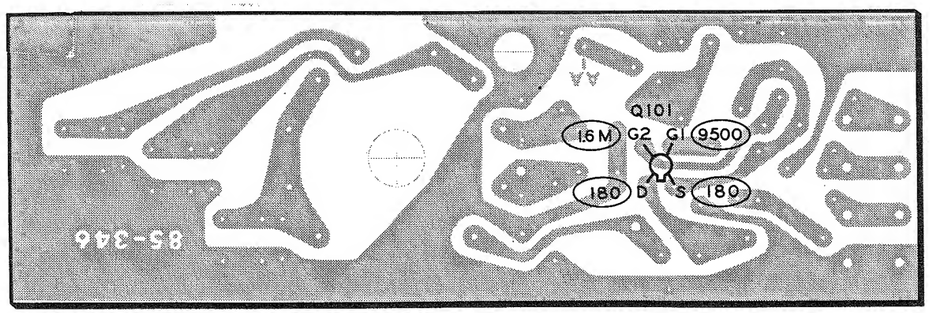
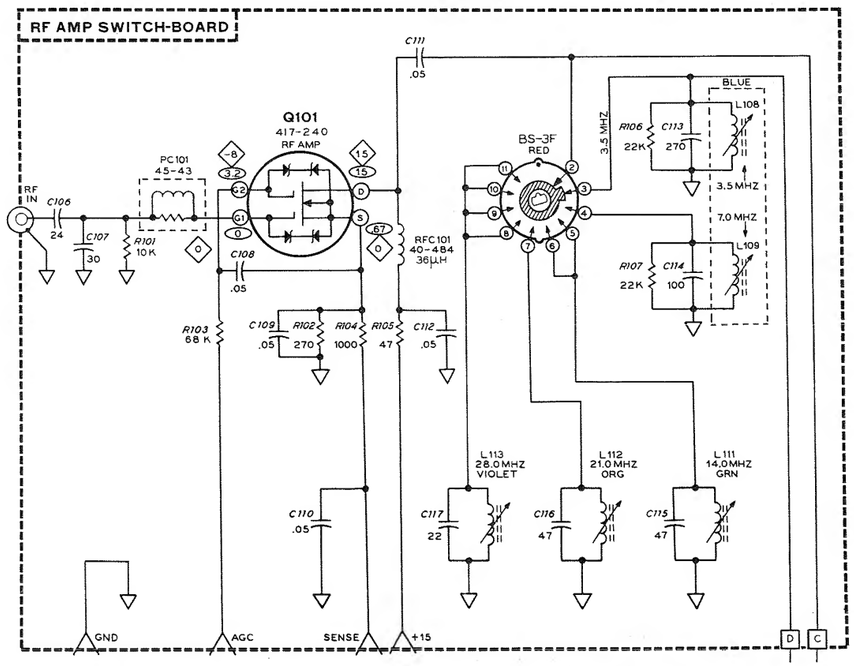
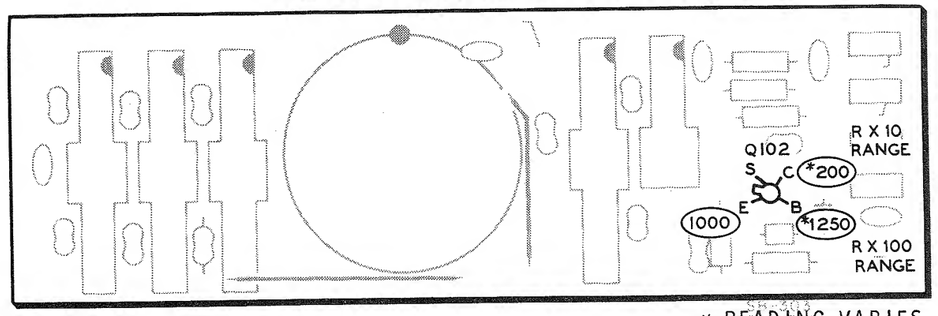


(SHOWN FROM FOIL SIDE)



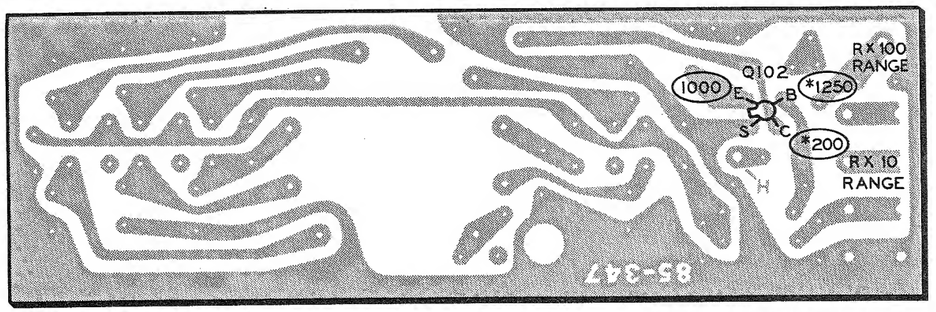
RF AMPLIFIER SWITCH-BOARD SCHEMATIC

RESISTANCE CHARTS

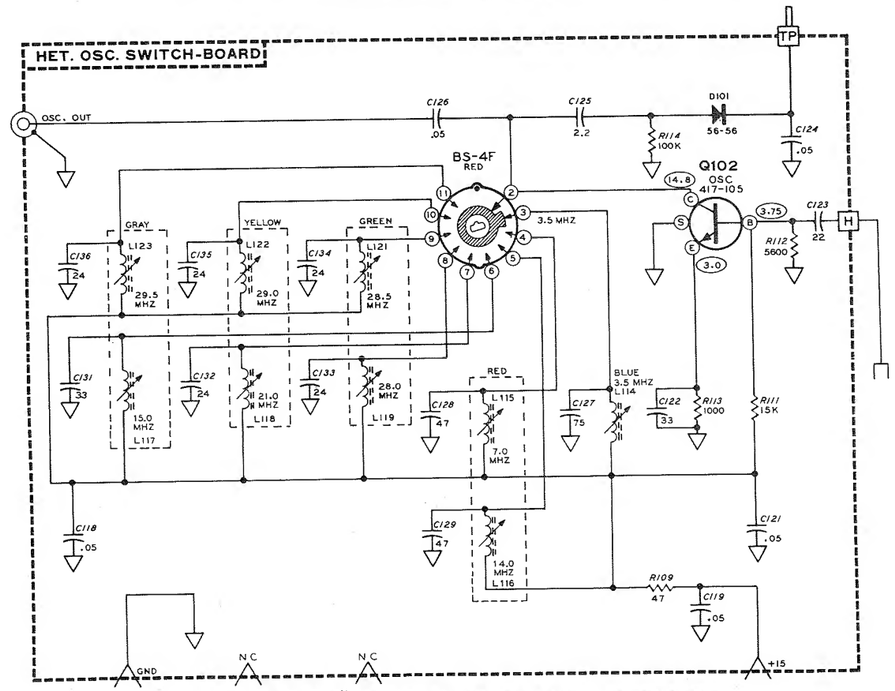


(SHOWN FROM COMPONENT SIDE)

* READING VARIES WITH METER RANGE



(SHOWN FROM FOIL SIDE)



HETERODYNE OSCILLATOR SWITCH-BOARD SCHEMATIC

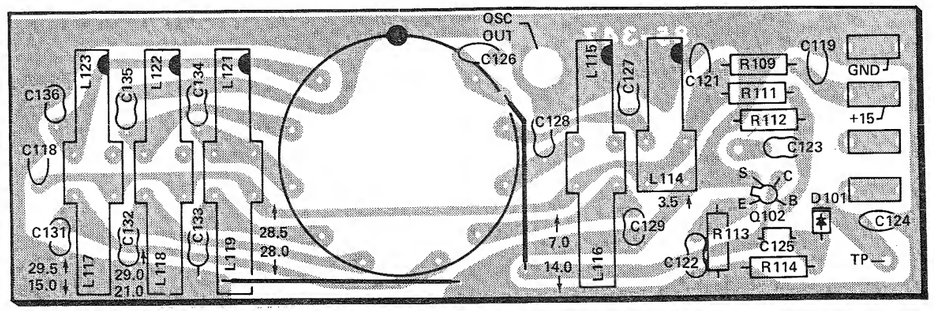
HEATHKIT

HETERODYNE OSCILLATOR SWITCH-BOARD

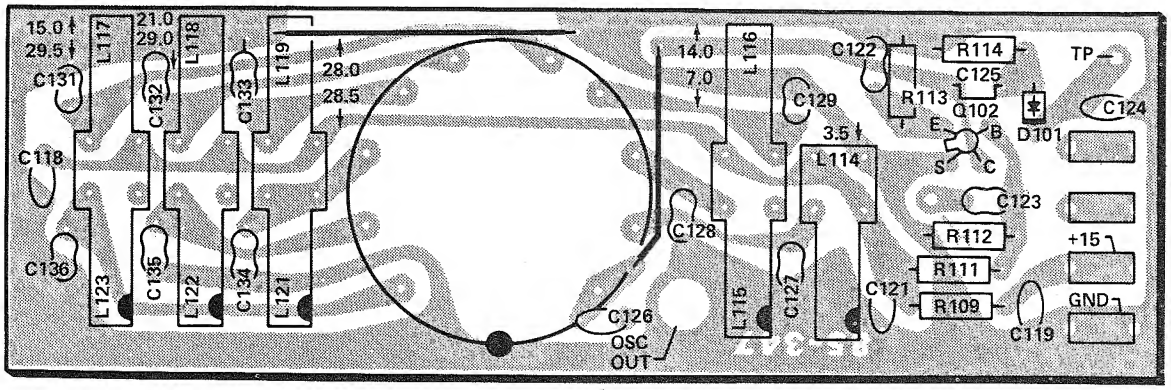
TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
HFO does not operate.	1. Transistor Q102 incorrectly installed or shorted. 2. Capacitor C118, C119 or C121 shorted. 3. Capacitor C122 open. 4. Heterodyne oscillator Switch-Board not connected to crystal Switch-Board. 5. Capacitor C123 open. 6. Switch wafer BS-4 of the BAND switch rotated 180 degrees from its correct position. 7. Oscillator coils incorrectly tuned. (It is necessary to retune the oscillator coils when connection is made to the HFO OUT jack on the rear panel.) 8. Heterodyne oscillator Switch-Board connectors not making contact with plug board connectors. 9. Refer to the "Crystal Troubleshooting Chart."

X-RAY VIEW

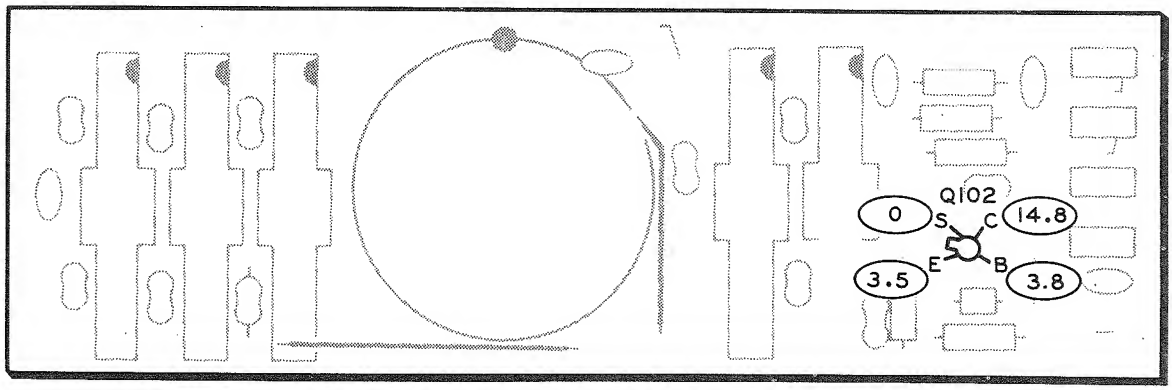


(SHOWN FROM COMPONENT SIDE)

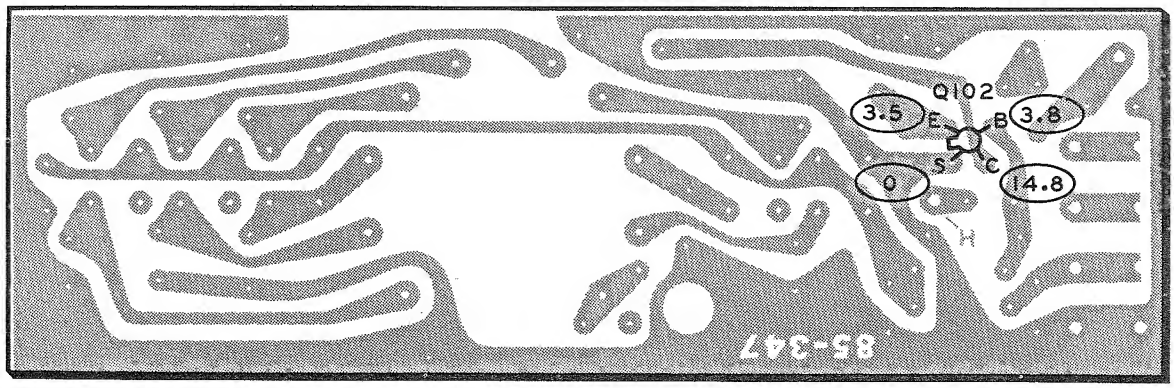


(SHOWN FROM FOIL SIDE)

VOLTAGE CHARTS



(SHOWN FROM COMPONENT SIDE)



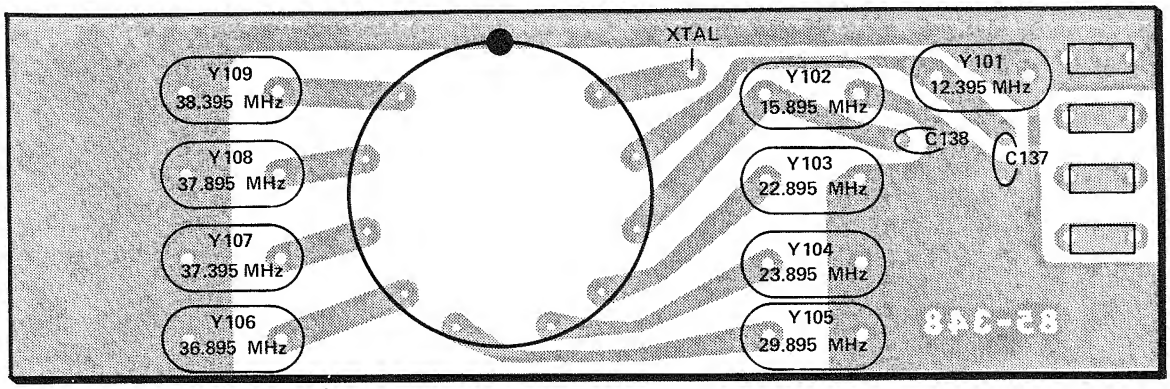
(SHOWN FROM FOIL SIDE)

CRYSTAL SWITCH-BOARD

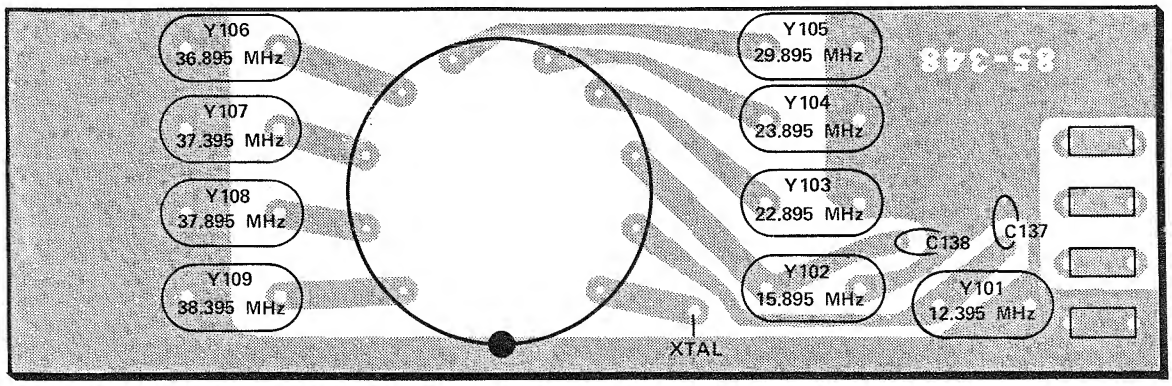
TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
HFO does not operate.	1. Switch wafer BS-5 of the BAND switch rotated 180 degrees from its correct position. 2. Defective crystal, crystal unsoldered, or crystals interchanged. 3. Refer to the "Mixer Troubleshooting Chart."

X-RAY VIEWS



(SHOWN FROM COMPONENT SIDE)



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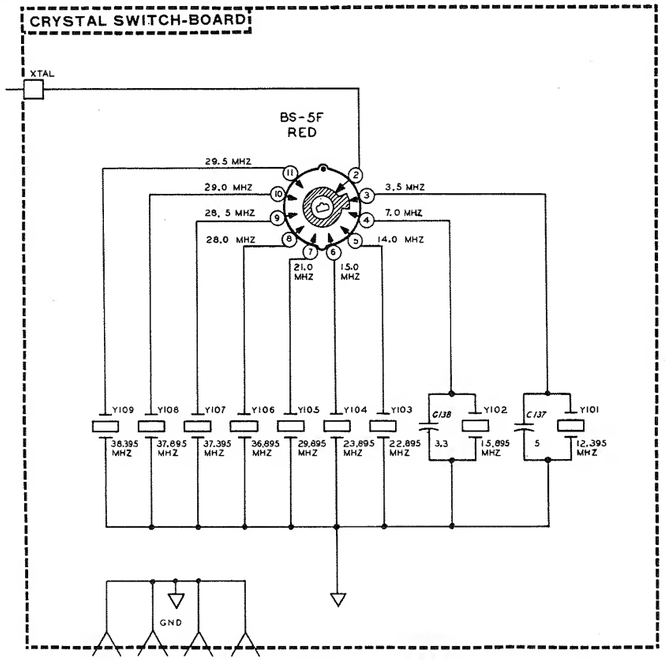
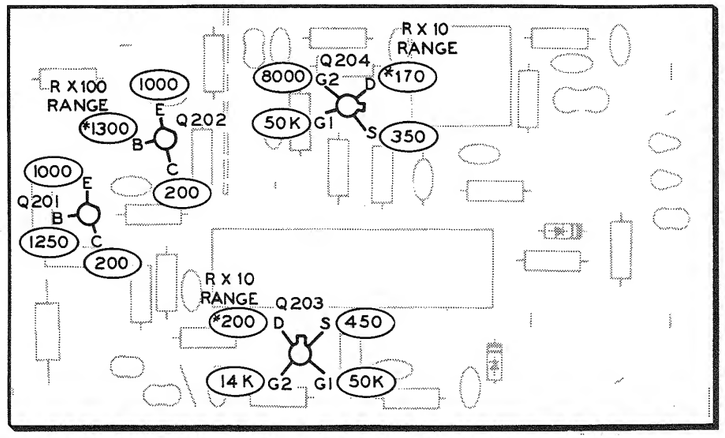


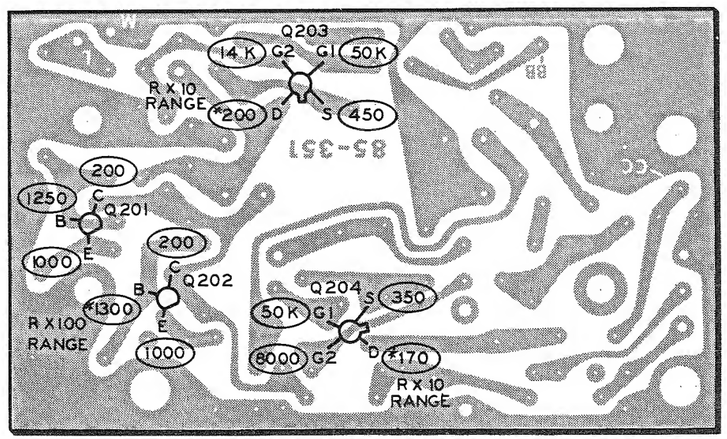
CRYSTAL SWITCH-BOARD SCHEMATIC

RESISTANCE CHARTS



(SHOWN FROM COMPONENT SIDE)

* READING VARIES
WITH METER RANGE



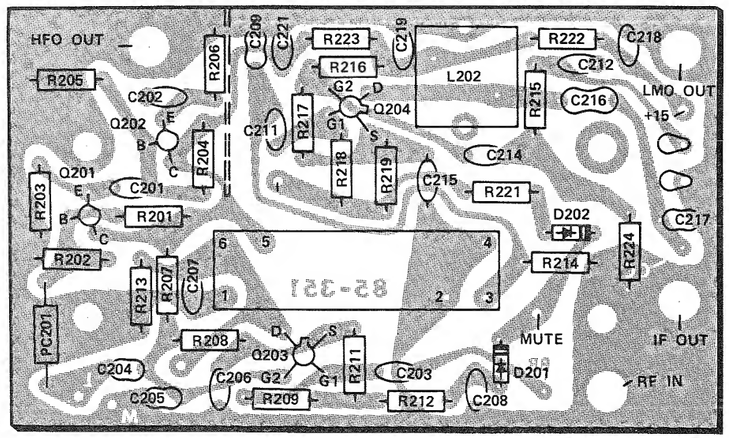
(SHOWN FROM FOIL SIDE)

MIXER CIRCUIT BOARD

TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
No output from the second mixer.	1. Coil L202 not tuned or shorted. 2. Diode D202 installed backward or shorted. 3. Transistor Q204 incorrectly installed or shorted. 4. Capacitor C218, C219 or C221 shorted. 5. Refer to the "Chassis Troubleshooting Chart."
No output from the first mixer.	1. Diode D201 installed backward or shorted. 2. Refer to the "Blanker Troubleshooting Chart."
HFO does not operate.	1. Coaxial cable not connected to HFO OUT jack on the mixer circuit board. 2. Transistor Q201 or Q202 incorrectly installed or shorted.

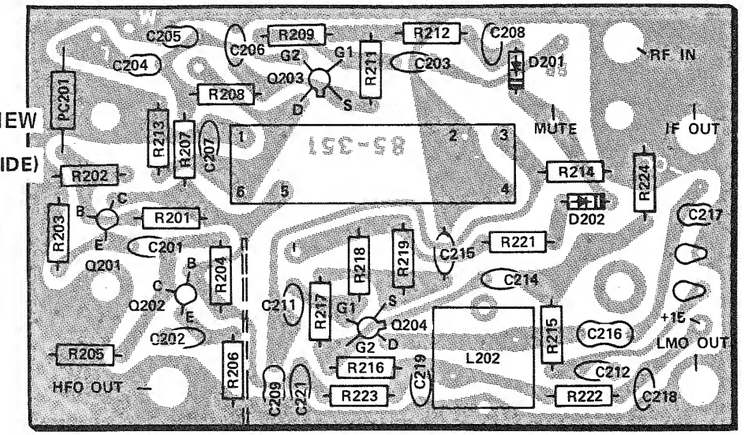
X-RAY VIEW



(SHOWN FROM COMPONENT SIDE)

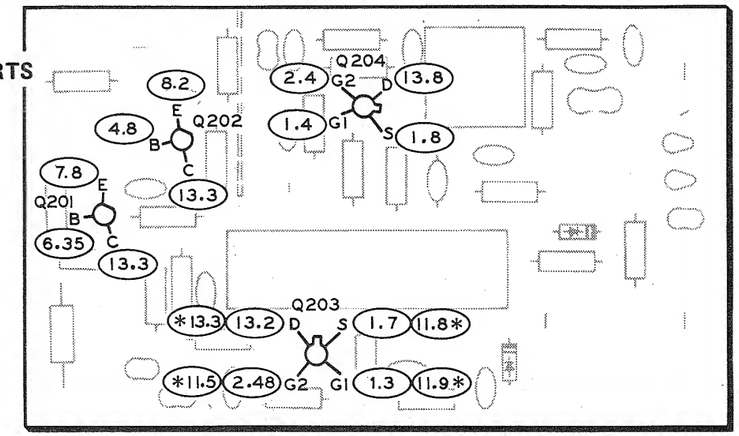
X-RAY VIEW

(SHOWN FROM FOIL SIDE)

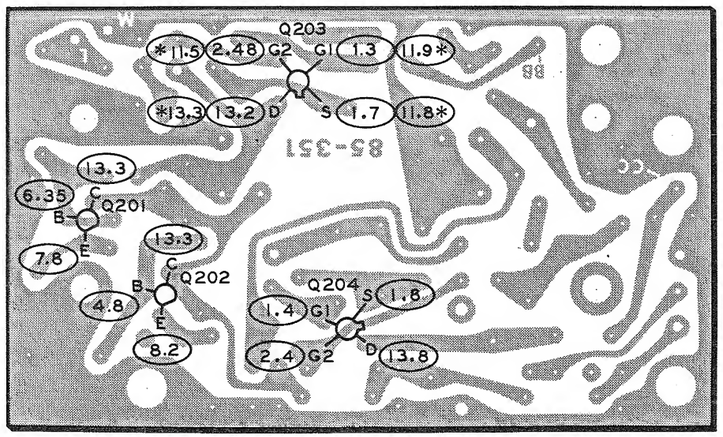


VOLTAGE CHARTS

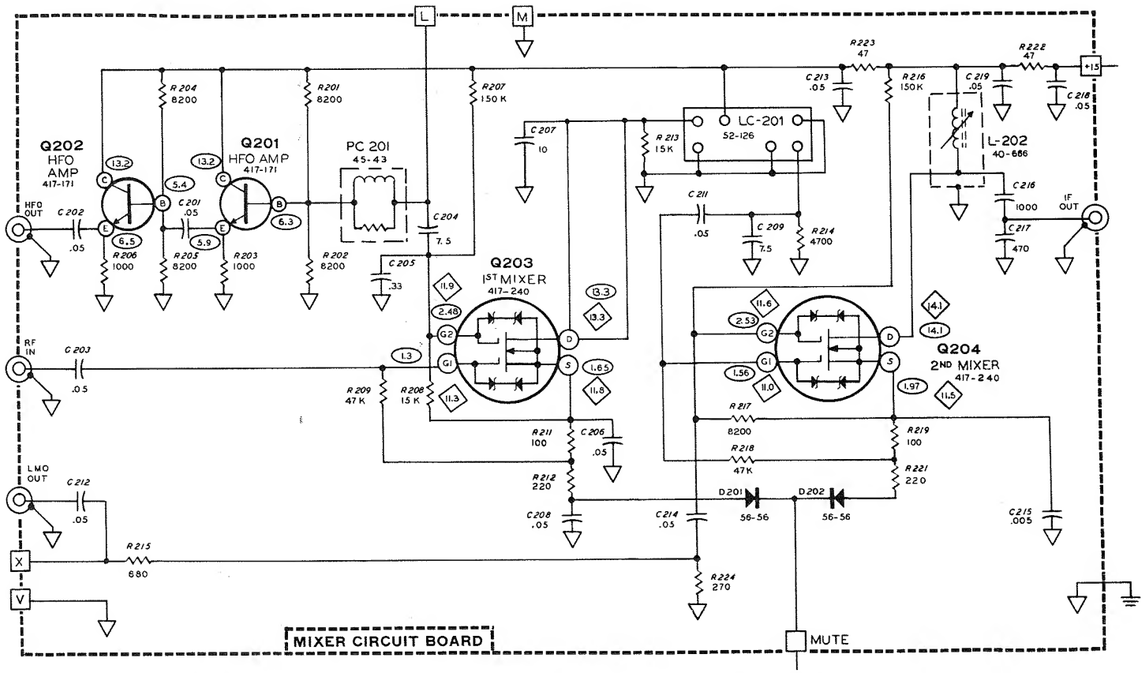
(SHOWN FROM COMPONENT SIDE)



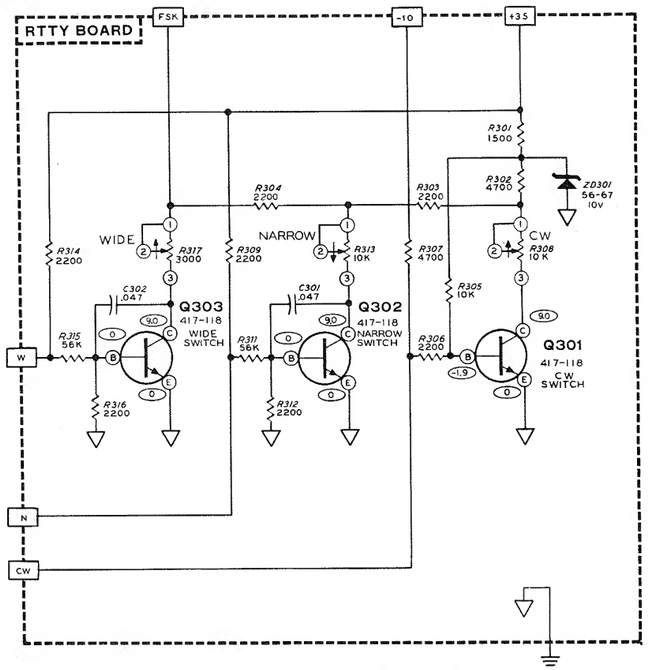
(SHOWN FROM FOIL SIDE)



*RECEIVER IS IN STANDBY



MIXER CIRCUIT BOARD SCHEMATIC



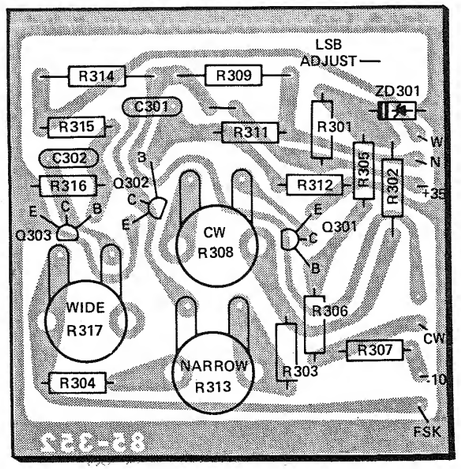
RTTY CIRCUIT BOARD SCHEMATIC

RTTY CIRCUIT BOARD

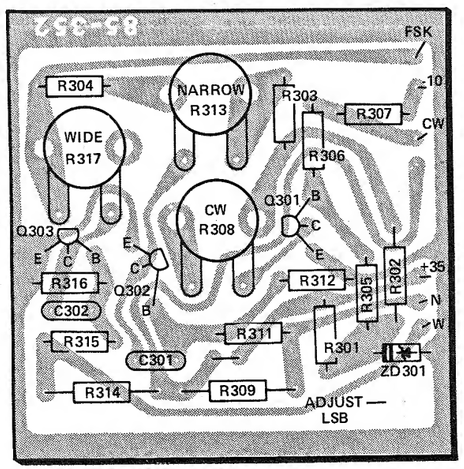
TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
RTTY does not operate.	1. Zener diode ZD301 installed backward or shorted. 2. Control R308, R313 or R317 open. 3. Transistor Q301, Q302, or Q303 incorrectly installed or shorted. 4. Circuit board ground foil not making contact with mounting clips.

X-RAY VIEWS

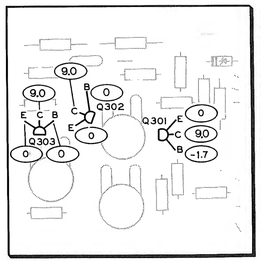


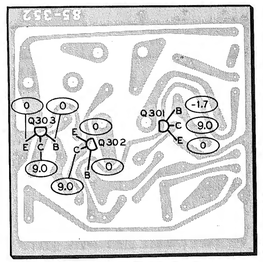
(SHOWN FROM COMPONENT SIDE)



(SHOWN FROM FOIL SIDE)

VOLTAGE CHARTS



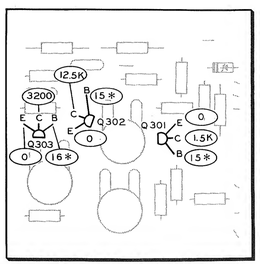


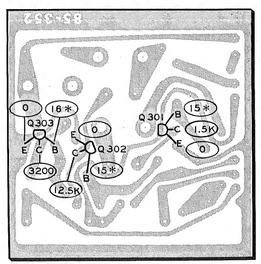
VOLTAGES MEASURED WITH ACCESSORY SOCKET LUGS 1 AND 5 GROUNDED, AND LUG 7 OPEN. MODE SWITCH IN RTTY POSITION.

(SHOWN FROM COMPONENT SIDE) (SHOWN FROM FOIL SIDE)

NOTE: VOLTAGE AND RESISTANCE MEASUREMENTS ARE DEPENDENT UPON SETTINGS OF CONTROLS R308, R313, AND R317.

RESISTANCE CHARTS

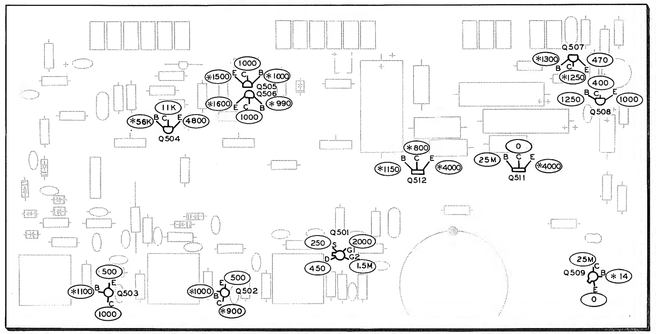




* FORWARD BIASED DIODE OR TRANSISTOR JUNCTION MAKES READING DEPENDENT ON OHMMETER RANGE.

(SHOWN FROM COMPONENT SIDE) (SHOWN FROM FOIL SIDE)

RESISTANCE CHARTS



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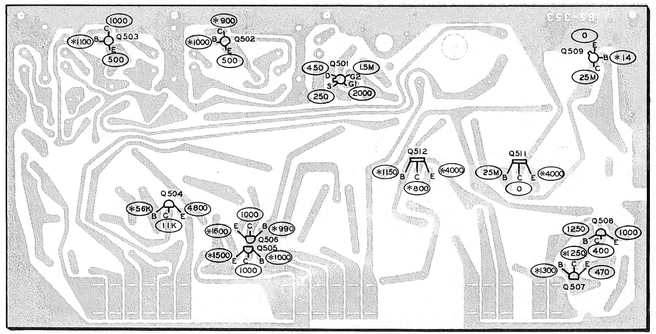
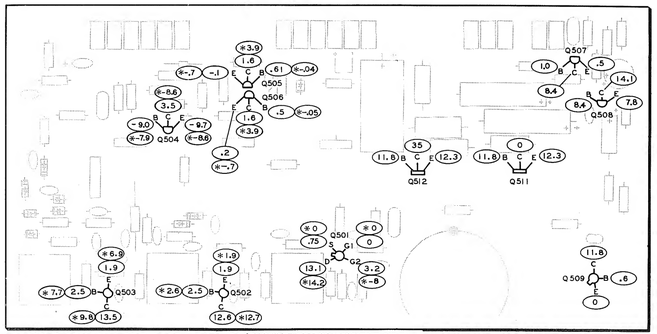


*FORWARD BIASED DIODE OR TRANSISTOR JUNCTION MAKES READING DEPENDENT ON OHMMETER RANGE.

(SHOWN FROM FOIL SIDE)

VOLTAGE CHARTS



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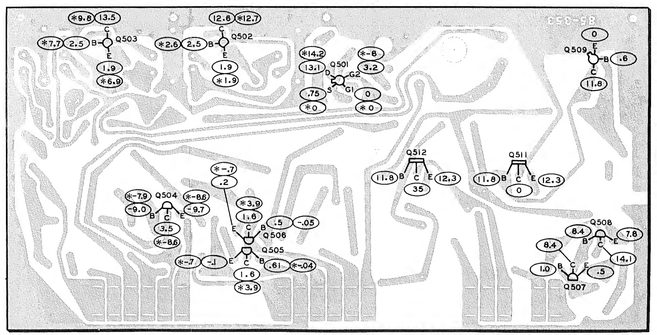


*RECEIVER MUTED

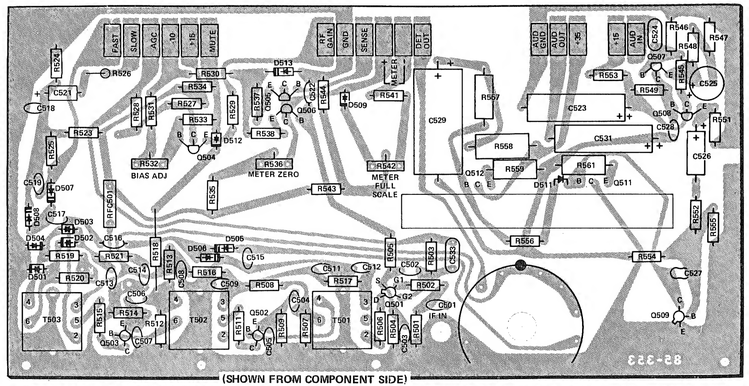
(SHOWN FROM FOIL SIDE)

IF/AUDIO CIRCUIT BOARD

TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
No audio output.	1. Transistor Q511 or Q512 incorrectly installed or shorted (check mica insulator placement). 2. Transistor Q509 open (normally runs warm to the touch). 3. The rotor in switch wafer MS-4 of the MODE switch, turned 180 degrees from its correct position. 4. BFO not operating. 5. Transistors Q507 and/or Q508.
BFO does not operate.	1. Shielded cable connected at J and K on the IF/Audio circuit board shorted. 2. Shielded cable lead at J and K on the IF/Audio circuit board interchanged. 3. BFO not operating, refer to the "Power Supply/BFO Troubleshooting Chart."
Product detector does not operate.	1. Diode D501, D502, D503 or D504 installed backward or shorted. 2. Capacitor C513 or C514 shorted. 3. BFO not operating. 4. Transformer T503 secondary damaged. 5. BFO not operating. 6. Refer to the "Power Supply/BFO Troubleshooting Chart."
AM detector does not operate.	1. Diode D505 or D506 installed backward or shorted. 2. Capacitor C515 shorted. . 3. Capacitor C516 shorted.
No IF output.	1. Transformer T501, T502 or T503 shorted. 2. RFC501 open. 3. Capacitor C516 or C517 shorted. 4. Capacitor C508, C509, C511 or C512 shorted. 5. Diode D513 installed backward or shorted. 6. Transistor Q501, R502 or Q 503 incorrectly installed or shorted.
No output from the RF Amplifier.	1. AGC voltage incorrect. 2. BIAS ADJ control on the IF/Audio circuit board set incorrectly.
AGC does not operate.	1. Diode D507 or D508 installed backward or shorted. 2. Capacitor C518 or C519 shorted. 3. Capacitor C521 reversed. 4. Transistor Q501 shorted. 5. Refer to the "RF Amplifier Troubleshooting Chart."
S meter does not operate.	1. Transistor Q501, Q505 or Q506 incorrectly installed or shorted. 2. Meter ZERO or METER FS controls not adjusted properly. 3. Capacitor C522 shorted. 4. Diode D509 installed backward or shorted. 5. Refer to the "RF Amplifier Troubleshooting Chart."

X-RAY VIEWS



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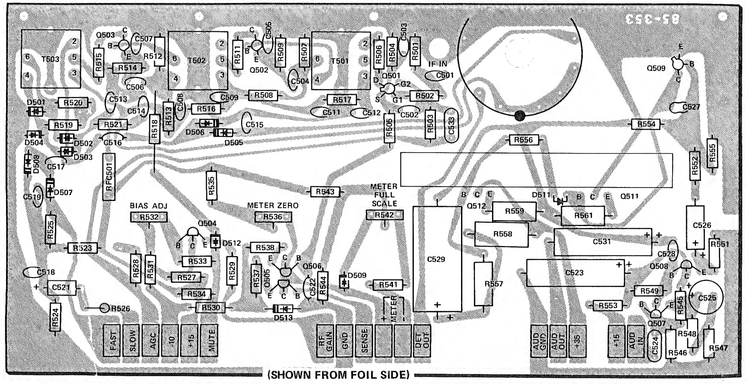

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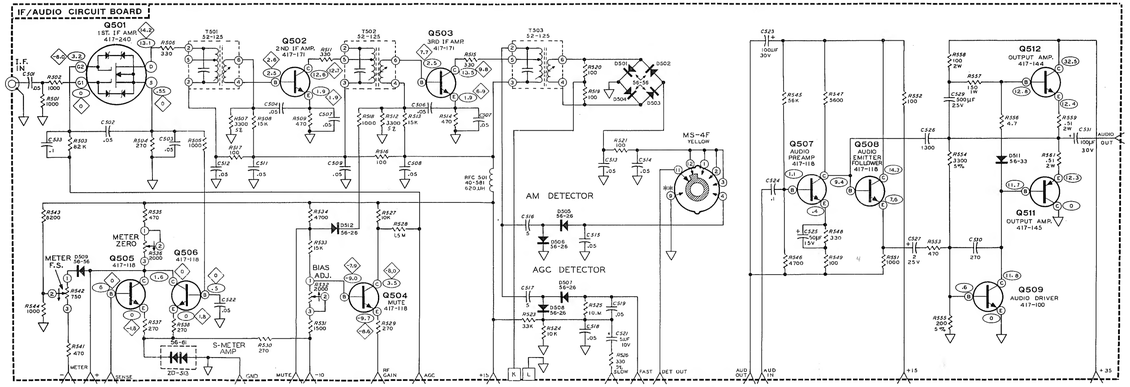
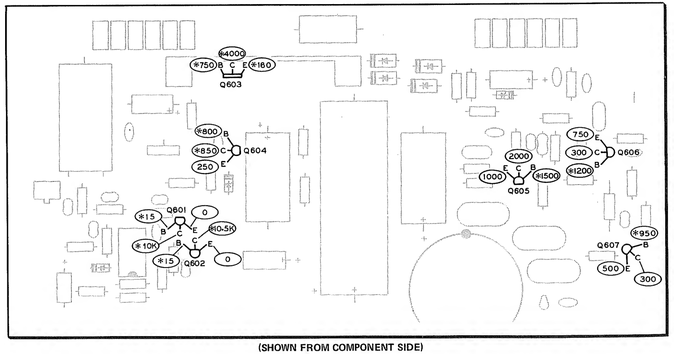


IF/AUDIO CIRCUIT BOARD SCHEMATIC

Stuffy
Operate

RESISTANCE CHARTS



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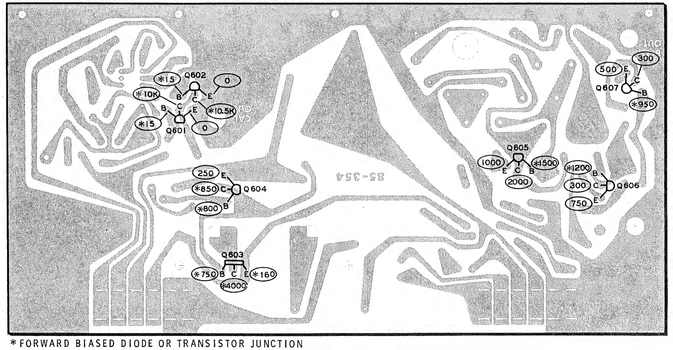

*FORWARD BIASED DIODE OR TRANSISTOR JUNCTION MAKES READING DEPENDENT ON OHMMETER RANGE.

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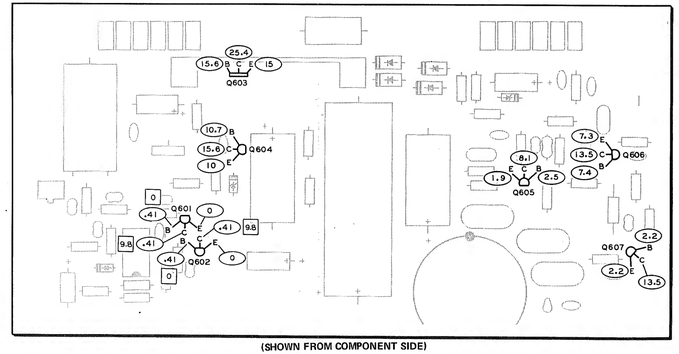
VOLTAGE CHARTS



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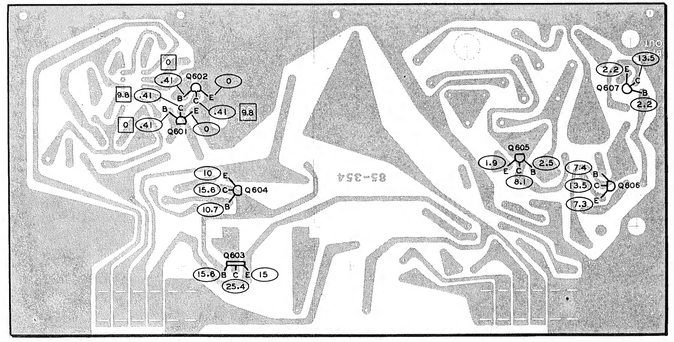


CALIBRATOR IN OFF POSITION

CALIBRATOR IN ON POSITION

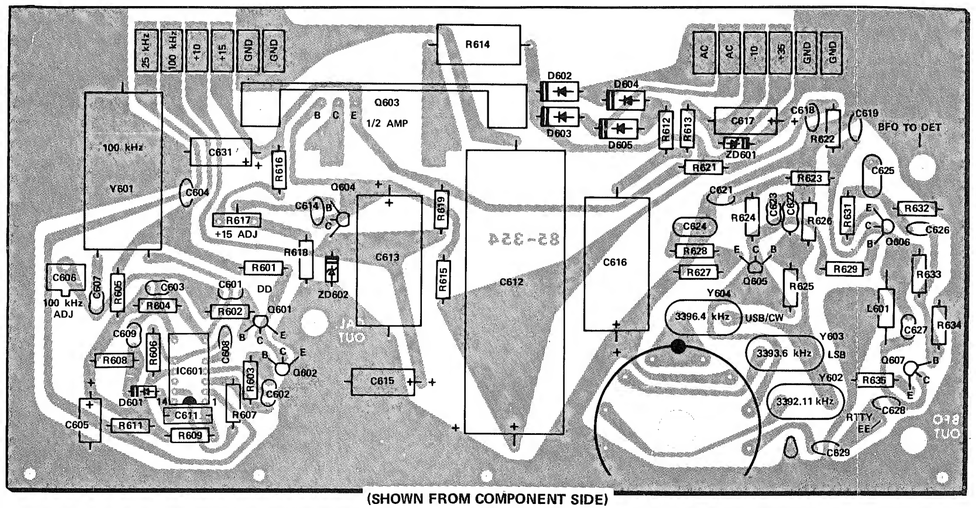
(SHOWN FROM FOIL SIDE)

POWER SUPPLY/BFO CIRCUIT BOARD

TROUBLESHOOTING CHART

SYMPTOM	POSSIBLE CAUSE
BFO does not operate.	1. Rotor in switch wafer MS-5 of the MODE switch turned 180 degrees from its correct position. 2. Transistor Q605, Q606 or Q607 incorrectly installed or shorted. 3. Crystal Y602, Y603 or Y604 defective.
Calibrator does not operate.	1. IC-601 installed incorrectly or shorted. 2. Crystal Y601 defective. 3. Capacitor C605 shorted. 4. Shielded cable not connected to BFO OUT jack. 5. Diode D601 installed backward or shorted. 6. Transistor Q601 or Q602 installed incorrectly or shorted. 7. Resistor R609 or capacitor C611 or C603 improper value or shorted.
+35-volt power supply voltage incorrect.	1. Diode D602 or D603 installed backward or shorted. 2. Capacitor C612 shorted.
+15-volt power supply voltage incorrect.	1. +35 volts not present. 2. Resistor R617 open or incorrectly adjusted. 3. Diode D607 installed backward or shorted. 4. Capacitor C613 shorted. 5. +15-volt line shorted. 6. +10-volt line shorted.
+10-volt power supply voltage incorrect.	1. +35 volts not present. 2. Diode D607 installed backward or shorted. 3. +10-volt line shorted. 4. Resistor R619 open.
−10-volt power supply voltage incorrect.	1. Diode D604, D605 or D606 installed backward or shorted. 2. Capacitor C616 or C617 reversed or shorted. 3. −10-volt line shorted.

X-RAY VIEWS



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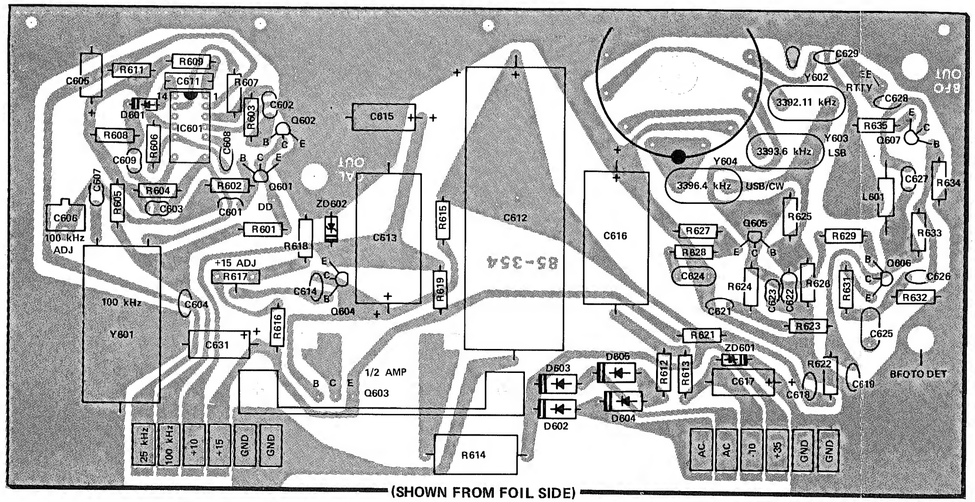

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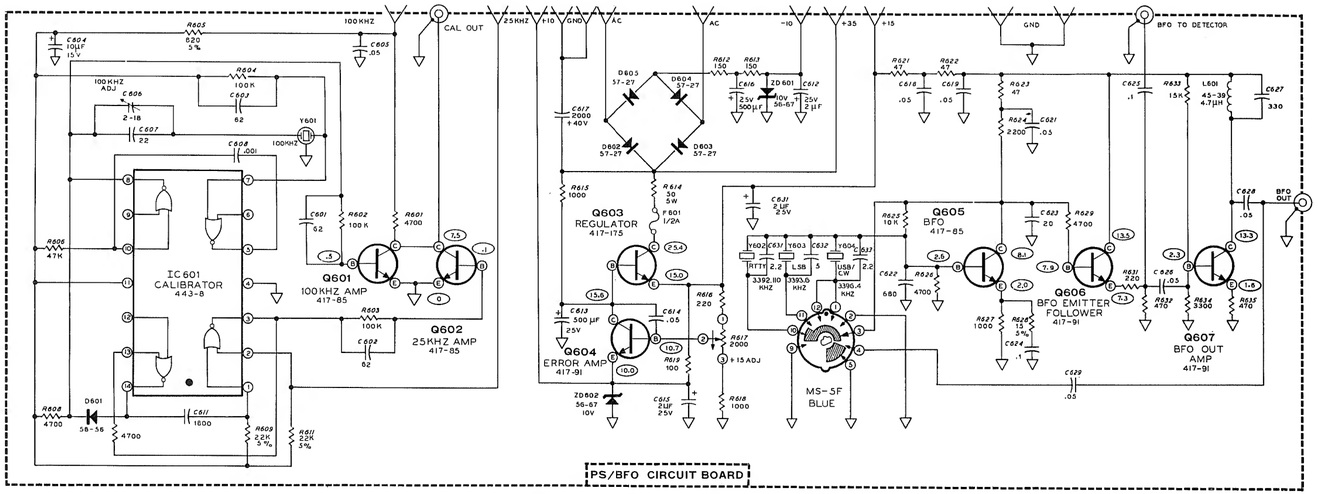
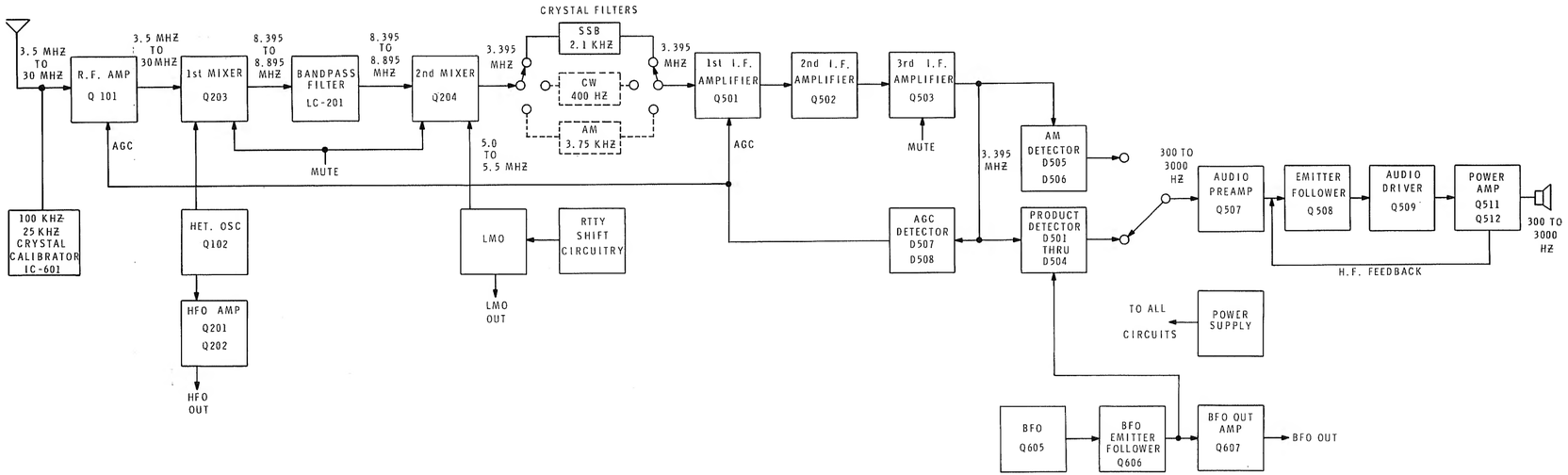


PS/BFO CIRCUIT BOARD SCHEMATIC



BLOCK DIAGRAM

SPECIFICATIONS

Frequency Range (Megahertz)	3.5 to 4.0, 700 to 7.3, 14.0 to 14.5, 15.0 to 15.3, 21.0 to 21.5, 28.0 to 30.
Intermediate Frequency (IF)	3.395 MHz.
Frequency Stability	Less than 100 Hz per hour after 10 minutes drift per hour after 10 minutes warmup under normal ambient conditions. Less than 100 Hz drift for ±10% line voltage variation.
Frequency Selection	Build-in LMO (Linear Master Oscillator).
Modes of Operations	
SSB	Single sideband (suppressed carrier, with selectable upper or lower sideband).
CW	Keyed continuous wave.
AM	Amplitude modulated continuous wave.
RTTY	Radio Teletype (frequency-shift keyed continuous wave). Wide shift, narrow shift, and narrow CW shift identification.
Sensitivity	Less than 0.25 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation.
Overall Gain	Less than 1.5 microvolt input for 0.5 watts audio output (single tone SSB).
AGC Characteristic	
Blocking	Greater than 3.0 V CW/SSB/RTTY.
Dynamic Range	Greater than 150 dB CW/SSB.
RF Attenuator Range	0-40 dB nominal.

Selectivity	
SSB	2.1 kHz 6 dB down, 5.0 kHz maximum at 60 dB down (crystal filter supplied).
CW	400 Hz at 6 dB down, 2.0 kHz maximum at 60 dB down (crystal filter available as an accessory).
AM	3.75 kHz at 6 dB down, 10 kHz maximum at 60 dB down (crystal filter available as an accessory).
RTTY	2.1 kHz at 6 dB down, 5.0 kHz maximum at 60 dB down (uses SSB crystal filter).
Image Rejection	60 dB or better.
IF Rejection	
3.395	Greater than 55 dB.
8.595	Greater than 50 dB.
Spurious Response	All below 1 microvolt equivalent signal input.
Temperature Range	10°C to 50°C ambient.
Dial Accuracy	
Electrical	Within 400 Hz after calibration at nearest 100 kHz or 25 kHz point.
Visual	Within 200 Hz.
Variation in RTTY shift as LMO frequency is changed (shift can be adjusted to nominal value at any point within the band).	
CW Shift (50 Hz nominal)	Less than 10 Hz/100 kHz.
Narrow Shift (170 Hz nominal)	Less than 20 Hz/100 kHz.
Wide Shift (850 Hz nominal)	Less than 100 Hz/100 kHz.
Calibration	Every 100 kHz or 25 kHz.
Dial Backlash	No more than 50 Hz.
Antenna Input Impedance	50 Ω nominal unbalanced.

Audio Response	
SSB	350 to 2450 Hz nominal at 6 dB.
CW (with accessory filter)	800 to 1200 Hz nominal at 6 dB.
AM (with accessory filter)	200 to 3500 Hz nominal at 6 dB.
RTTY	1840 to 3940 Hz nominal at 6 dB.
Audio Output Impedance	
Matching Speaker	8 Ω.
Matching Headphones	Low impedance.
Audio Output Power	4 watts at less than 10% distortion.
Muting	Open external ground at Mute socket.
Power Requirements	105 to 130 or 210 to 260 volt ac, 40 watts maximum.
Controls	
Front Panel	Main Tuning dial. Function switch. Mode switch. Band switch. AGC switch. Converter switch. AF Gain control/Power on-off. RF Gain/Speaker Disable. Preselector. RF Attenuator.
Circuit Boards	
IF/Audio	Bias adjust. Meter zero. Meter full scale.
PS/BFO	+15 V adjust. 100 kHz adjust.
RTTY	Wide shift. Narrow shift. CW shift.

Connections

Rear Panel	Phones. HF Antenna. VHF Antenna #1. VHF Antenna #2. Mute. Anti-Vox. Speaker. HFO out. LMO out. BFO out. CW shift. 4-Spare sockets. 3-Wire line cord socket. Accessory Socket (RTTY and VHF converter connections).

NOTE: Specifications measured with 120 Vac line voltage at 25°C.

Cabinet Dimensions	12-1/4" wide x 6-5/8" high x 13" deep.
Overall Dimensions (with knobs and feet installed)	12-1/4" wide x 7-15/16" high x 14" deep.
Net Weight	15-3/4 lbs.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

CIRCUIT DESCRIPTION

The Circuit Description is provided to give you a better understanding of what is happening in each stage of your Receiver. Refer to the Block Diagram (fold-out from Page 160) and the Schematic Diagram (fold-out from Page 173) when reading this Circuit Description.

Letter number designations for the resistors, capacitors, and other components are placed in the following groups to make it easier to locate parts on the Schematic and on the chassis.

101 to 199	Parts mounted on the antenna, RF amplifier, heterodyne oscillator, and crystal Switch-Boards.
201 to 299	Parts mounted on the mixer circuit board.
301 to 399	Parts mounted on the RTTY circuit board.
501 to 599	Parts mounted on the IF/audio circuit board.
601 to 699	Parts mounted on the power supply/BFO circuit board.
701 to 799	Parts mounted on the chassis.

GENERAL

Signals are received by the antenna and coupled through the Band switch and the antenna tuned circuits on the antenna Switch-Board to the RF amplifier Switch-Board. Here the signal is amplified by FET Q101 and then coupled to the mixer circuit board. The signal is mixed in the first mixer FET Q203, with a signal from the oscillator Switch-Board. This mixing produces an 8.395 MHz to 8.895 MHz frequency which is coupled through bandpass filter LC201 to the second mixer FET Q204.

A signal produced by the LMO (linear master oscillator) is mixed with the 8.395 MHz signal in the second mixer to produce a 3.395 MHz IF signal. The IF signal is then connected from the mixer circuit board, through the Mode switch and crystal filter, to the IF/audio circuit board.

The IF signal is amplified by Q501, Q502, and Q503. The signal is then coupled to either the product detector, or the AM detector, depending on the mode of operation, where it is detected.

The detected audio signal is amplified by transistors Q507, Q508, Q509, Q511, and Q512. The resulting audio output is then connected to the Phones jack, the Anti-VOX jack, and through the Speaker Disable switch to the Speaker jack.

On the following pages, each circuit will be described in detail. The circuits will be described as they would operate in the Receiver under normal signal conditions with the Mode switch in the USB position, the Function switch in the Operate position, and the Band switch in the 3.5 position.

ANTENNA TUNING CIRCUITS

Signals from the antenna input jack are coupled through the converter switch to the RF attenuator. This control reduces the amplitude of the incoming signal before it reaches the RF amplifier circuits. The receiver then is able to handle very strong signals without overloading. If the receiver is being overloaded by a strong signal adjacent to a desired weak signal, the readability of the weak signal can be improved by increasing the RF attenuation.

Signals are then coupled through band-switch wafer BS-IF to a tuned circuit consisting of coil L101 and capacitors C101,

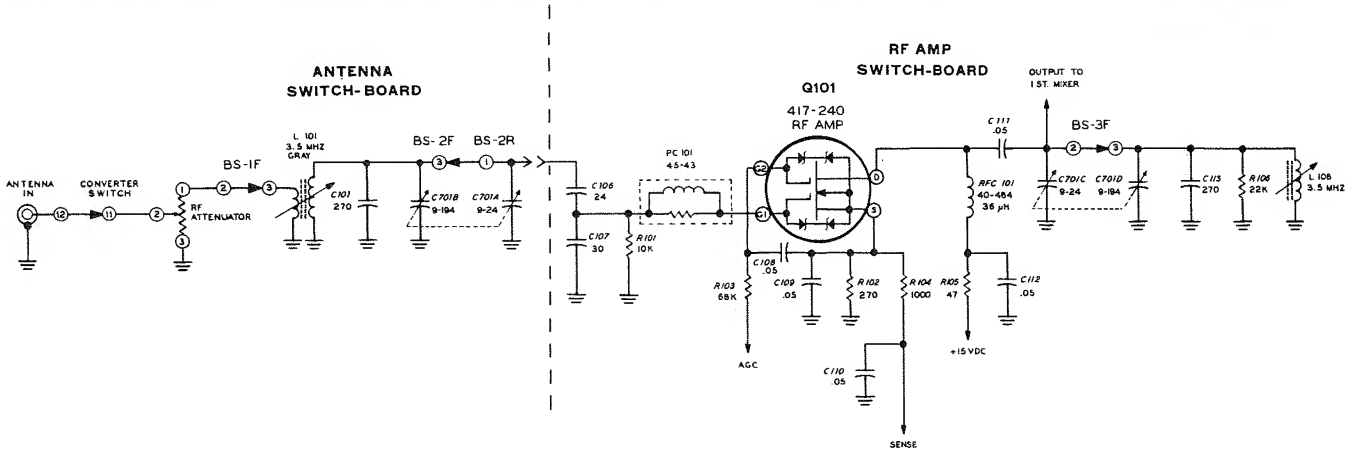


Figure 31

C701A, C701B, C106, and C107. This tuned circuit allows only part of the total received frequencies to pass. Assume the Receiver is tuned to 3.8 MHz; then the 3.800 MHz incoming signal is tuned by Preselector capacitors C701A and C701B and coupled through band switch wafer BS-2F and BS-2R to the RF amplifier circuit.

RF AMPLIFIER CIRCUIT

A simplified schematic is shown in Figure 31. The Signal (3.800 MHz) from the RF In jack is coupled through capacitor C106 and parasitic choke PC-101 to FET Q101 where it is amplified. The parasitic choke suppresses VHF oscillations. Further signal selectivity is provided by the tuned circuit consisting of coil L108, resistor R106 and capacitors C113, C701C, and C701D.

Power is supplied to Q101 through resistor R105 and RF choke RFC101. AGC voltage is coupled through resistor R103 and applied to gate G2 of Q101. A dc-sensing current is removed from the source (S) of Q101, filtered by capacitors C109 and C110, and coupled through resistor R104 to the S-meter circuit.

FIRST MIXER CIRCUIT

The 3.800 MHz input signal is coupled through capacitor C203 to gate G1 of FET Q203. A 12.395 MHz signal from the HFO (heterodyne frequency oscillator) is coupled through capacitor C204 to gate G2 of Q203. These two signals are mixed to produce sum and difference frequencies (16.195 MHz and 8.595 MHz) at the drain (D) of FET Q203. The 16.195 MHz signal is rejected by the bandpass filter LC-201, which allows only the 8.595 MHz signal to pass through to the second mixer.

Resistors R207, R208, R209, R211, and R212 bias Q203. Source (S) current is coupled through diode D201 to ground when the mute circuit is closed, to permit normal operation. When the mute circuit is opened, a positive voltage back biases diode D201 and causes Q203 to cut off.

SECOND MIXER CIRCUIT

The 8.595 MHz signal from bandpass filter LC-201 is coupled through capacitor C211 to gate G1 of FET Q204. A 5.200 MHz signal from the LMO* (linear master oscillator) is coupled through resistor R215 and capacitor C214 to gate G2 of Q204. These two signals are mixed to produce sum and difference frequencies (13.795 MHz and 3.395 MHz) at the drain (D) of Q204. A tuned circuit consisting of coil L202 and capacitors C216 and C217 is tapped to provide the required 2000 Ω source impedance to the crystal filter.

Resistors R216, R217, R218, R219, and R221 bias Q204. Capacitor C212 couples the 5.200 MHz signal from the LMO to the LMO Out jack for external use. Source (S) current is coupled through diode D202 to ground when the mute circuit is closed to permit normal operation. When the mute circuit is opened, a positive voltage back biases diode D202 and causes Q204 to cut off.

*NOTE: The LMO output frequency increases as the frequency of the incoming signal decreases. For example: when the Receiver is tuned to 3.5 MHz, the LMO output frequency is 5.5 MHz; when the Receiver is tuned to 4.0 MHz, the LMO output frequency is 5.0 MHz.

LMO

The LMO is a sealed unit containing a capacity-tuned silicon transistor oscillator and a transistor bandpass amplifier. (Since internal circuitry may vary between units due to temperature compensation, a schematic of this circuit is not included.) The tuning capacitor is factory-adjusted to provide a linear frequency change with dial rotation, giving

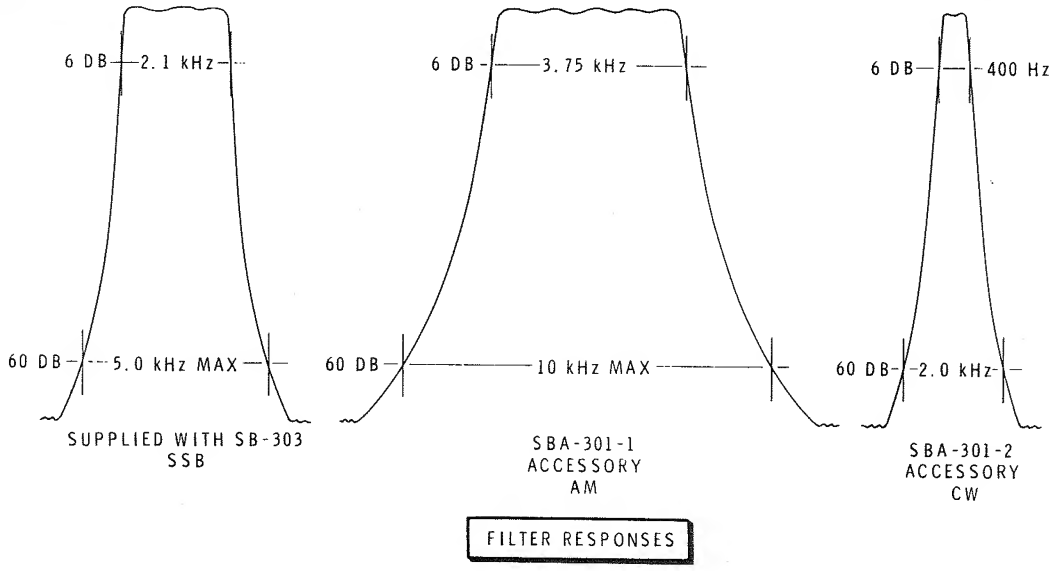


Figure 32

100 kHz change per turn of the shaft between 5 and 5.5 MHz.

To provide the same dial reading in both USB and LSB, the LMO frequency must be shifted 2.8 kHz by the Mode switch. When a positive voltage is applied to the shift bias terminal (in USB and CW), it causes a switching diode to conduct, changing inductance in the oscillator circuit and causing a 2.8 kHz frequency change in the LMO. A negative voltage (in LSB) will open the diode switch, shifting the frequency to the correct operating point for LSB operation. This operating point can be adjusted by the sideband shift adjustment on top of the LMO.

CRYSTAL FILTERS

The 13.795 MHz and 3.395 MHz signals are coupled through mode switch wafer MS-1F to the 2.1 kHz crystal filter. The 13.795 MHz signal is rejected by this filter, which allows only the 3.395 MHz signal to pass. Mode switch wafers MS-2R and MS-2F couple this signal to the IF circuit.

This Receiver is supplied with a 2.1 kHz SSB crystal filter. The sharp selectivity provided by this filter permits excellent rejection of unwanted adjacent signals. A 3.75 MHz AM filter and a 400 Hz CW filter are available as optional accessories. The filter responses are shown in Figure 32.

IF CIRCUITS

The 3.395 MHz signal is coupled from the IF input, through capacitor C501 and resistor R502, to gate G1 of FET Q501. The signal is amplified and coupled from the drain (D) of Q501, through resistor R506, through IF transformer T501, to the base of transistor Q502. Transformer T501 provides correct impedance matching between FET Q501 and transistor Q502. The signal is amplified again by Q502 and coupled through resistor R511 and IF transformer T502 to the base of transistor Q503. Transformer T502 provides impedance matching between transistor Q502 and Q503. The signal is amplified again by transistor Q503 and coupled through resistor R515 to IF transformer T503.

Power is supplied to the IF circuits through resistors R517, R516, and RF choke RFC501.

AM DETECTOR

From the primary winding of transformer T503, and 3.395 MHz signal is coupled through capacitor C516 to the AM detector. Here the signal is detected by diodes D505 and D506 and filtered by capacitor C515. The detected audio is coupled through mode switch MS-4F to AF Gain control R703.

PRODUCT DETECTOR

The 3.395 MHz signal is coupled from the secondary of transformer T503 to resistors R520 and R519 and to detector diodes D501, D502, D503, and D504. A signal from the BFO (beat frequency oscillator) is coupled to the junction of resistors R519 and R520. When the BFO signal goes positive, diodes D501 and D503 conduct. When the BFO signal goes negative, diodes D502 and D504 conduct. The result is a "chopping" of the 3.395 MHz signal at a rate equal to the BFO frequency. This produces signals that are equal to the sum and difference of the 3.395 MHz and BFO signals. The higher of these two frequencies is filtered by capacitor C513 and C514 and resistor R521. The lower frequency is the detected audio which is coupled through mode switch wafer MS-4F to AF Gain control R703.

AUDIO CIRCUITS

Audio is coupled from AF Gain control R703 through capacitor C524 to the base of transistor Q507. Audio preamplifier transistor Q507 presents a high input impedance to the detectors because of unbypassed emitter resistor R549. The amplified signal from the collector of Q507 is direct coupled to emitter follower transistor Q508. This transistor has a low output impedance which is needed to drive audio driver transistor Q509. The amplified signal from Q509 is direct coupled to the base of transistor Q511 and coupled through diode D511 and resistor R556 to the base of transistor Q512. Transistors R511 and Q512 form a push-pull complementary output amplifier. On positive half cycles of the signal transistor Q512 conducts, and on negative half cycles transistor Q511 conducts.

Resistor R554 couples negative feedback to the base of transistor Q509. At frequencies above 3000 Hz, capacitor C526 couples negative feedback to the base of transistor Q508.

Diode D511 is mounted on the same heat sink as Q511 and Q512. Therefore, the voltage drop across this diode will vary with the temperature of the heat sink to compensate for changes in the operating point of Q511 and Q512.

Capacitor C529 is a "bootstrap" capacitor which provides feedback to transistor Q511 and Q512. This feedback keeps the supply voltage constant to the transistors, which reduces distortion at high volume levels.

AGC CIRCUIT

Refer to Figure 33 for a simplified schematic of the AGC circuit.

From the primary of transformer T503, the 3.395 MHz signal is coupled through capacitor C517 to the AGC detector. Diodes D507 and D508 rectify the signal to produce a dc AGC voltage which is filtered by capacitor C519. The AGC voltage is fed directly to the AGC switch as fast AGC. The fast AGC is coupled from the AGC switch to

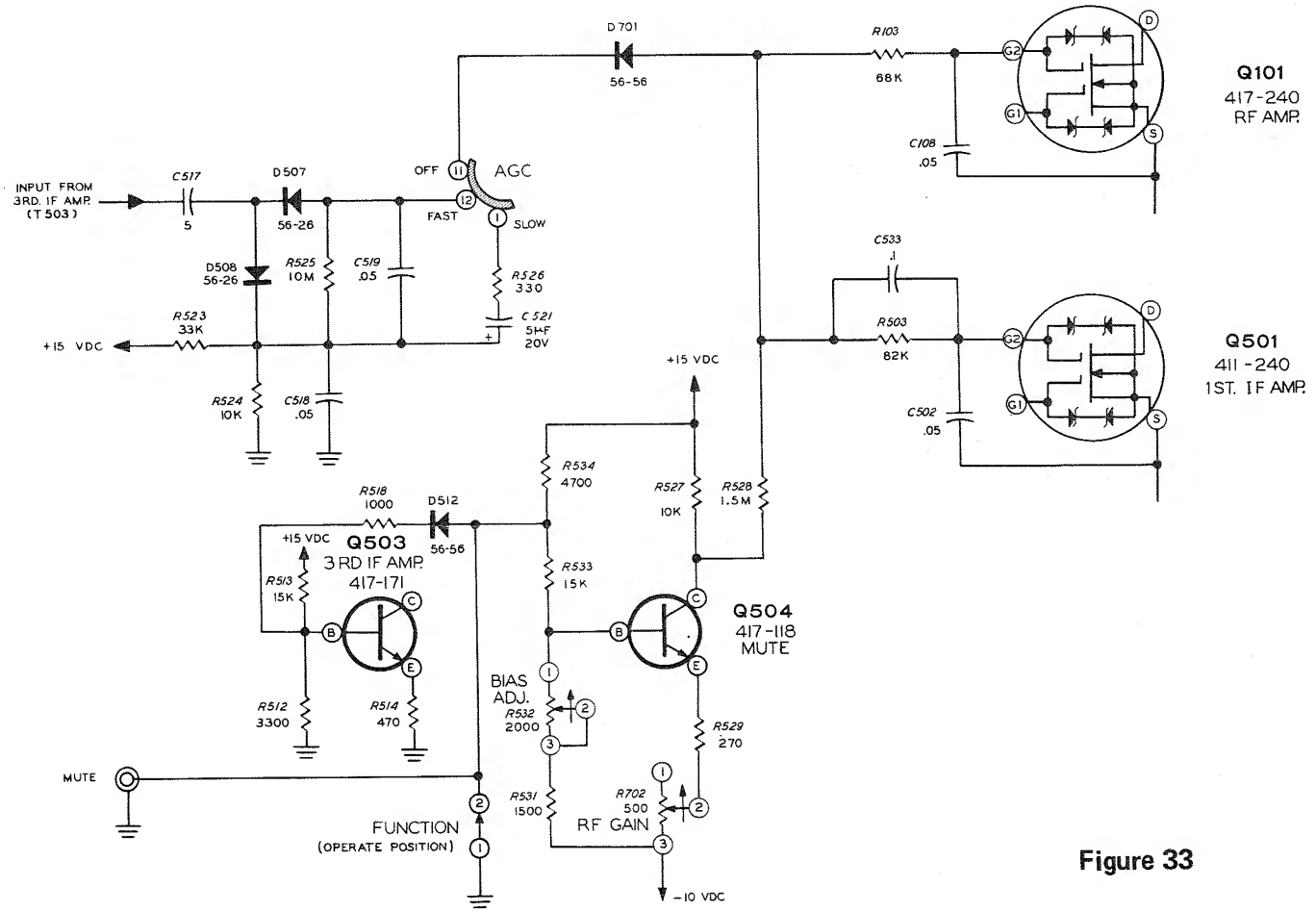


Figure 33

gate #2 of RF amplifier transistor Q101 and to gate #2 of first IF amplifier, transistor Q501. Excellent AGC action is obtained due to the wide AGC range of the dual gate MOS FET transistors.

For SSB operation it is desirable to have an AGC with a fast attack and a slow decay time. This is accomplished by placing the AGC switch in the SLOW position, which connects capacitor C521 and resistor R526 to the AGC line. The time constant of the resistor-capacitor combination allows fast charging of the capacitor, which results in fast-attack AGC. However, as the received signal disappears, the capacitor discharges slowly, resulting in a slow AGC decay time.

MUTE CIRCUIT

Mute transistor Q504 normally operates with a no-AGC-signal collector voltage of about 3.5 volts which is coupled to the AGC line through resistor R528. When the mute line is opened, the base of transistor Q504 becomes more positive, which results in greater collector current and a greater voltage drop across resistor R527. The result is a negative voltage on the AGC line, which cuts off Q101 and Q501. Also, the mute line is now positive, which causes diode D512 to conduct and increase the base current of transistor Q503. This increase in base current saturates Q503 to the point where it has no gain.

When the mute line is grounded, the RF gain can be adjusted by RF Gain control R702 which varies the AGC voltage. Bias Adjust control R532 determines the no-AGC-signal voltage on the collector of transistor Q504.

S-METER CIRCUIT

The source current from FET Q101 in the RF circuit is coupled through resistor R104 to the base of transistor Q505. In the same manner, the source current from FET Q501 is coupled through resistor R505 to the base of transistor Q506. The collectors of Q505 and Q506 are connected to the positive side of the S meter. When a strong signal is received, the source currents of Q101 and Q505 are decreased due to AGC voltage. This negative-going voltage at the bases of transistors Q505 and Q506 causes their collector voltage to increase. The increased collector voltage is reflected across the S meter, providing an S-meter reading proportional to the received signal strength.

Diode D509 effectively connects the upper portion of control R542 across the meter at readings above half scale. This provides a linear dB deflection at the upper half of the meter scale.

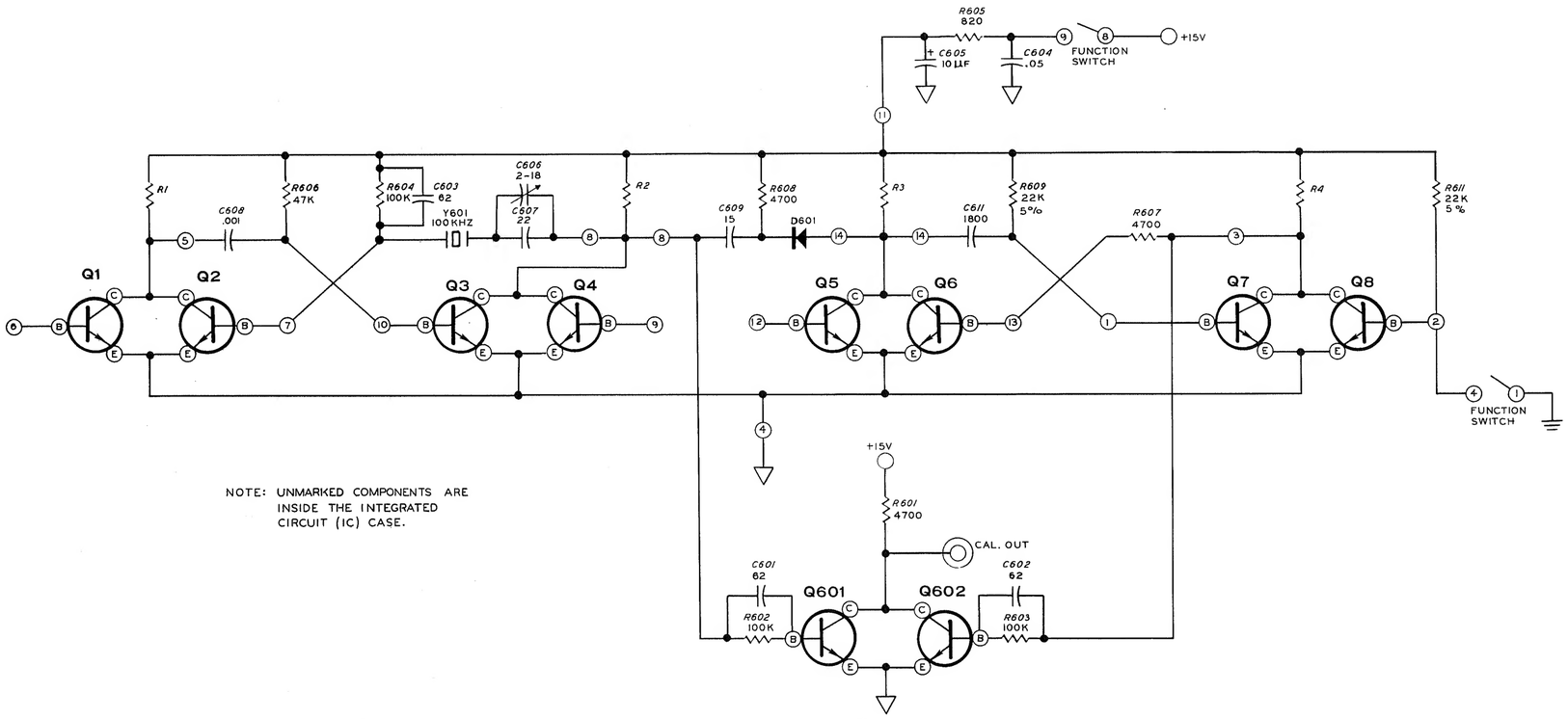
HFO AND HFO AMPLIFIER

The HFO (Heterodyne Frequency Oscillator) operates as a tuned-collector, tuned-base oscillator. The base tuned circuit is a crystal which insures accurate and stable output frequency. The crystal is selected by band switch wafer BS-5F and coupled through capacitor C123 to the base of HFO transistor Q102. The collector tuned circuit is connected to the collector of Q102 through band switch wafer BS-4F. A detector circuit consisting of capacitors C124, C125, resistor R114 and diode D101 is provided for HFO alignment.

Power is supplied to the collector of transistor Q102 through resistor R109 and through the collector tuned coil, which in this case is L114. Resistors R111, R112, and R113 bias transistor Q102.

The oscillator signal is coupled from the collector of transistor Q102, through capacitor C126, to the first mixer and the HFO amplifier.

The signal is coupled through parasitic choke PC201 to the base of transistor Q201. The signal is coupled through emitter follower transistors Q201 and Q202 to the HFO OUT phono socket on the Receiver rear panel. The emitter followers present a high input impedance to the high frequency oscillator and a low output impedance to the HFO OUT phono socket. The HFO output voltage is used for transceive operation with a Heath Model SB-400 or SB-401 Transmitter.



NOTE: UNMARKED COMPONENTS ARE INSIDE THE INTEGRATED CIRCUIT (IC) CASE.

CALIBRATOR SCHEMATIC

FIGURE 35

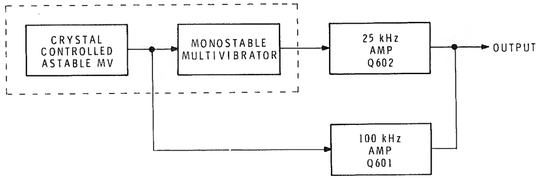


Figure 34

CRYSTAL CALIBRATOR

A block diagram of the crystal calibrator is shown in Figure 34. The dotted line on the block diagram indicates circuitry in integrated circuit IC601. Figure 35 is a simplified schematic of the crystal calibrator circuitry including components inside the intergrated circuit.

When the Function switch is placed in the 100 kHz position, +15 volts is coupled through switch contacts 8 and 9 to the calibrator circuit. Transistors Q2 and Q3 are connected as an astable multivibrator. This circuit oscillates at a frequency determined by crystal Y601, and it can be adjusted slightly by trimmer capacitor C606.

The base of transistors Q1, Q4, and Q5 are not connected to the circuit, so these transistors have no effect in the circuit. Transistors Q6 and Q7 are connected as a monostable multivibrator which divides the 100 kHz output of Q3 to produce a 25 kHz output. The time constant of the multivibrator is determined by resistor R609 and capacitor C611.

Initially transistor Q7 is conducting and transistor Q6 is cut off. This places the collector of Q6 and the anode of diode D601 at 3.5 volts. When transistor Q3 of the multivibrator conducts, the cathode voltage of D601 drops and the diode conducts. This lowers the collector voltage on transistor Q6 and triggers the multivibrator. Diode D601 is now reverse biased until the multivibrator returns to its initial state.

When the Function switch is not in the 25 kHz position, transistor Q8 conducts because of the base current through resistor R611. This clamps the collectors of Q7 and Q8 to ground and prevents the multivibrator from operating.

When the Function switch is in the 25 kHz position, the base of transistor Q8 is grounded, which brings it out of saturation. This permits normal operation of the multivibrator. The outputs of the astable and monostable multivibrators are amplified and added together in transistors Q601 and Q602. Figure 36 illustrates waveforms at four different points in the calibrator circuit when the Function switch is in the 25 kHz position.

BFO AND BFO AMPLIFIER

The BFO (beat frequency oscillator) is a crystal controlled oscillator composed of transistor Q605 and its associated circuitry. Crystals Y602, Y603, and Y604 are selected by mode switch wafer MS-5F to provide different frequencies.

The BFO signal from BFO transistor Q605 is coupled through resistor R629 to the base of transistor Q606. The signal from the emitter of Q606 is coupled through resistor R631 and capacitor C625 to the BFO to Detector jack. From here the signal will be coupled to the product detector.

The BFO signal is also coupled through capacitor C626 to transistor Q607 where the signal is amplified. The amplified signal from the collector of Q607 is coupled through capacitor C628 to the BFO Out jack. Coil L601 and capacitor C627 provide tuning for the BFO signal.

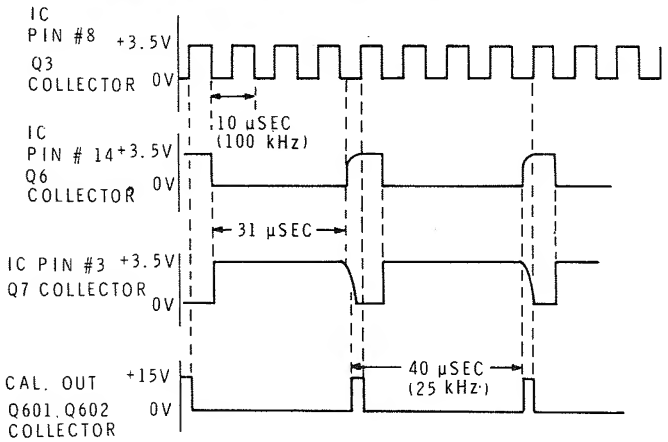


Figure 36

When the Mode switch is in the AM position, the collector of Q605 is grounded through Mode switch MS-5E. When the Mode switch is in the RTTY position, the output of Q607 is grounded through capacitor C629 and switch wafer MS-5F.

POWER SUPPLY

AC power is supplied through the circuit breaker and switch S701 to the primary of transformer T701. Transformer T701 has dual primary windings to permit operation from either 120 or 240 volts ac. The ac current from the secondary of transformer T701 is coupled to the full-wave rectifier.

Diodes D604 and D605 form the negative rectifier. From here negative dc power is supplied through resistors R612 and R613 to the Receiver. The negative dc supply is filtered by capacitors C616 and C612 and regulated by zener diode ZD601.

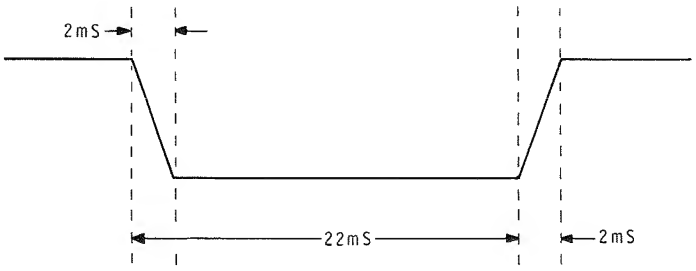
Diodes D602 and D603 form the positive voltage rectifier. From here positive dc is coupled through resistor R614 and the 1/2-ampere fuse to transistor Q603. The output power from Q603 is coupled through resistor R616 and control R617 to the base of transistor Q604. When the output power attempts to rise, the base voltage of Q604 increases. This causes Q604 to conduct heavier and decrease the current at the base of transistor Q603. This decrease in base current causes Q603 to appear as a high resistance in series with the output power. The reverse action takes place if the output voltage attempts to decrease.

RTTY CIRCUIT

When transceiving in the RTTY (radio teletype) mode, the LMO (linear master oscillator) frequency is shifted by changing the bias on a variable capacitance diode inside the LMO. The amount of shift is controlled by the RTTY shift circuit. When the transmitter is not keyed, the "wide" and "narrow" control lines are grounded. When the "wide" shift line is open, transistor Q303 conducts and causes the voltage at the FSK (frequency shift keying) terminal on the LMO to decrease. The amount of this decrease is adjusted by control R317.

The value of capacitor C302 is chosen to provide rise and fall times in the FSK voltages as shown in Figure 37.

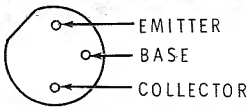
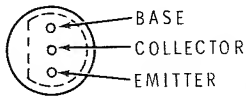
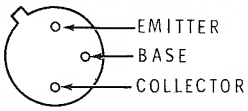
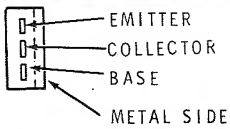
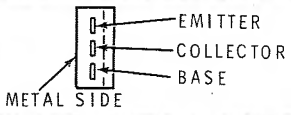
The narrow switch transistor Q302, operates in a manner similar to Q303. CW switch Q301 is normally off, and the CW line is normally open. When an external key closes the CW line to ground, a narrow shift occurs. The amount of shift is controlled by control R308. Zener diode ZD301 regulates the voltage supplied to transistors Q301, Q302, and Q303.

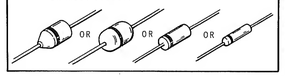
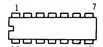


FSK VOLTAGE

Figure 37

BASING DIAGRAMS

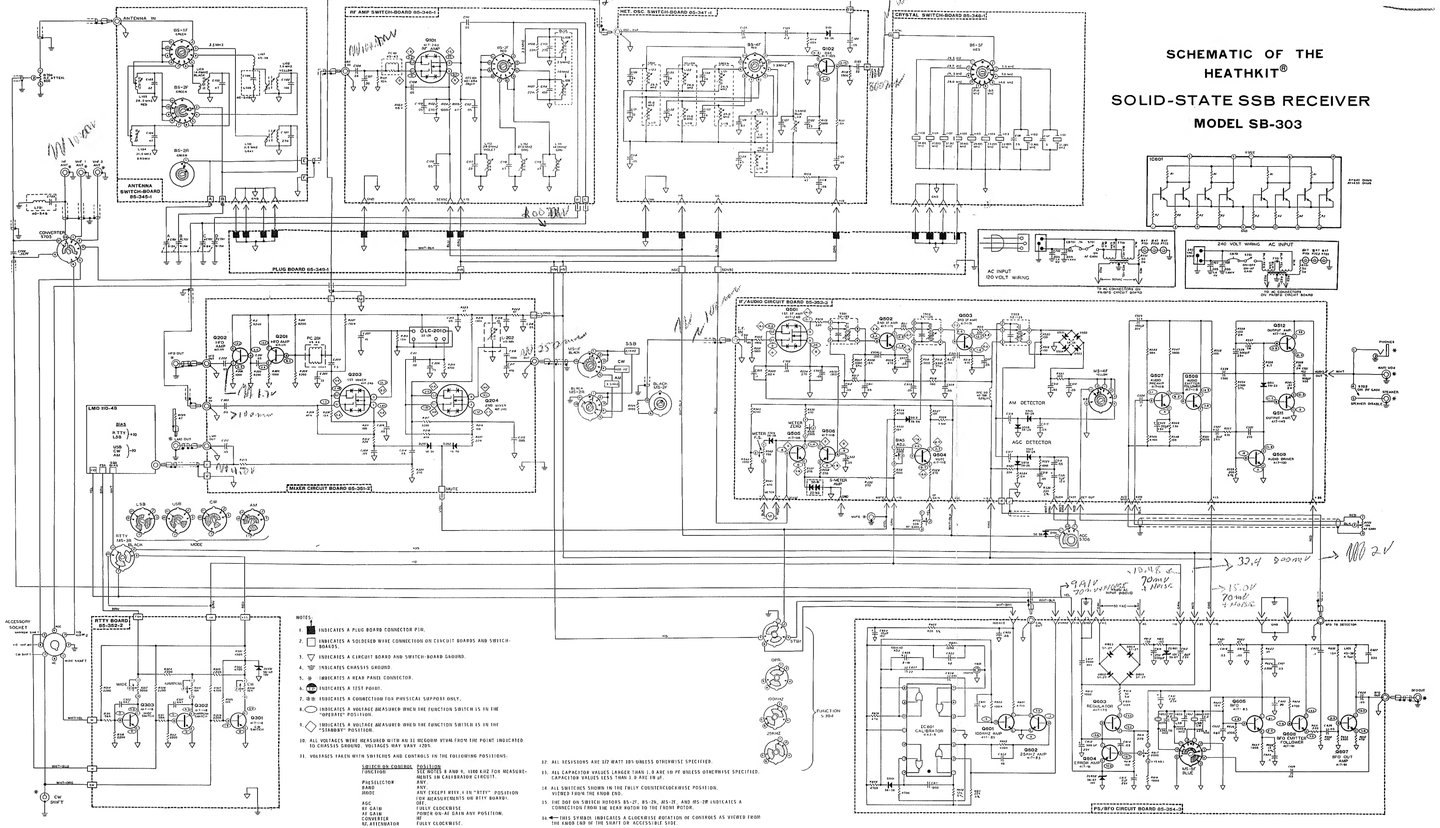
COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	BASE DIAGRAM (BOTTOM VIEW)
Q101, Q203, Q204, Q501	417-240	RCA 40673	
Q102	417-105	FAIRCHILD SE-5023	
Q201, Q202, Q502, Q503	417-171	FAIRCHILD 2N3694	
Q301, Q302, Q303, Q504, Q505, Q506, Q507, Q508	417-118	G.E. OR T.I. 2N3393	
Q604 Q606 Q607	417-91	G.E. OR T.I. 2N5232A	
Q601, Q602, Q605	417-85	G.E. E844	
Q509	417-100	RCA 2N3053	
Q603	417-175	RCA OR T.I. 2N5294	
Q511	417-145	MOT. MJE-371	
MOTOROLA MATCHED PAIR			
Q512	417-144	MOT. MJE-512	

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	BASE DIAGRAM (BOTTOM VIEW)
D101, D201, D202, D501, D502, D503, D504, D509, D512, D601, D701	56-56	1N4149	NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES. 
D505, D506, D507, D508.	56-26-1	1N191	
D511	56-33	1N3754	
D602, D603, D604, D605	57-27	1N2071	
D513	56-61	G.E. STB-620	
ZD601, ZD602, ZD301	56-67	VR-10A	
IC601	443-8	MOT. MC724P	

SCHEMATIC OF THE HEATHKIT®

SOLID-STATE SSB RECEIVER

MODEL SB-303

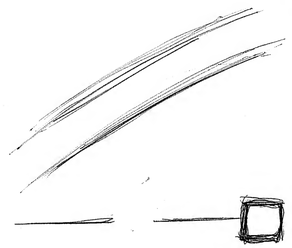


NOTES:

1. ■ INDICATES A PLUG BOARD CONNECTOR PIN.
2. □ INDICATES A SOLDERED WIRE CONNECTION ON CIRCUIT BOARDS AND SWITCH-BOARDS.
3. ▽ INDICATES A CIRCUIT BOARD AND SWITCH-BOARD GROUND.
4. ⏚ INDICATES CHASSIS GROUND.
5. ⊕ INDICATES A REAR PANEL CONNECTOR.
6. ⊕ INDICATES A TEST POINT.
7. ⊕ INDICATES A CONNECTION FOR PHYSICAL SUPPORT ONLY.
8. ⬭ INDICATES A VOLTAGE MEASURED WHEN THE FUNCTION SWITCH IS IN THE "OPERATE" POSITION.
9. ◇ INDICATES A VOLTAGE MEASURED WHEN THE FUNCTION SWITCH IS IN THE "STANDBY" POSITION.
10. ALL VOLTAGES WERE MEASURED WITH AN 11 MEGOHM VTVM FROM THE POINT INDICATED TO CHASSIS GROUND. VOLTAGES MAY VARY ±20%.
11. VOLTAGES TAKEN WITH SWITCHES AND CONTROLS IN THE FOLLOWING POSITIONS:

SWITCH OR CONTROL FUNCTION	POSITION
	SET NOTCH, R AND R, 1000 KHZ FOR MEASUREMENTS ON CALIBRATOR CIRCUIT.
FUNCTION	STBY
BAND	ANY
MODE	ANY EXCEPT RTTY; FOR "RTTY" POSITION SEE MEASUREMENTS ON RTTY BOARD.
AGC	OFF
RF GAIN	FULLY CLOCKWISE
AF GAIN	PRIOR TO AF GAIN ANY POSITION.
NOTCH FREQ.	MID
NOTCH ATTENUATOR	FULLY CLOCKWISE.

12. ALL RESISTORS ARE 1/2 WATT 10% UNLESS OTHERWISE SPECIFIED.
13. ALL CAPACITOR VALUES LARGER THAN 1.0 ARE 10 PF UNLESS OTHERWISE SPECIFIED. CAPACITOR VALUES LESS THAN 1.0 ARE IN µF.
14. ALL SWITCHES SHOWN IN THE FULLY COUNTERCLOCKWISE POSITION. VIEWED FROM THE KNOB END.
15. THE 500 OHM SWITCH ROTORS 85-27, 85-26, 85-17, AND 85-28 INDICATES A CONNECTION FROM THE REAR ROTOR TO THE FRONT ROTOR.
16. ⟵ THIS SYMBOL INDICATES A CLOCKWISE ROTATION OF CONTROLS AS VIEWED FROM THE KNOB END OF THE SHAFT OR ACCESSIBLE SIDE.



Test
Sep 15-16

50W

REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to Replacement Parts in the Kit Builders Guide.

ANTENNA, RF AMPLIFIER, HETERODYNE OSCILLATOR, AND CRYSTAL SWITCH-BOARDS

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1-1	.10	47 Ω
1-42	.10	270 Ω
1-9	.10	1000 Ω
1-18	.10	5600 Ω
1-20	.10	10 kΩ
1-21	.10	15 kΩ
1-22	.10	22 kΩ
1-60	.10	68 kΩ
1-26	.10	100 kΩ
CAPACITORS		
Mica		
20-99	.15	22 pF
20-77	.15	24 pF
20-100	.15	30 pF
20-160	.15	33 pF
20-101	.15	47 pF
20-110	.15	75 pF
20-102	.15	100 pF
20-114	.20	270 pF
Ceramic		
21-33	.10	3.3 pF
21-78	.10	5 pF
21-143	.20	.05 μF
Phenolic		
28-1	.10	2.2 pF (red-red-white)
RF CHOKES-DIODE-TRANSISTORS		
45-38	.20	Choke
45-43	.25	Choke
56-56	.20	1N4149 diode
417-105	1.20	SE5023 transistor
417-240	2.40	40673 transistor
COILS		
40-484	.15	36 μH fixed inductor
40-546	.60	Tuned trap
40-969	.90	Antenna
40-970	1.15	Antenna
40-971	.90	Antenna
40-972	.90	Antenna
40-973	.90	Antenna

PART No.	PRICE Each	DESCRIPTION
Coils (cont'd.)		
40-975	.85	RF
40-976	.85	RF
40-977	.85	RF
40-978	.85	Oscillator
40-974	1.20	RF
40-979	1.20	Oscillator
40-980	1.20	Oscillator
40-981	1.20	Oscillator
40-982	1.20	Oscillator

CRYSTALS

404-207	4.30	12.395 MHz
404-208	4.30	15.895 MHz
404-209	4.65	22.895 MHz
404-210	4.65	29.895 MHz
404-211	4.65	36.895 MHz
404-212	4.65	37.395 MHz
404-213	4.65	37.895 MHz
404-214	4.65	38.395 MHz
404-279	4.35	23.895 MHz

CONNECTORS

432-77	.10	Switch-board connector
432-120	.10	Pin socket
432-121	.10	Connector pin
434-186	.10	Board phono socket
438-4	.10	Phono plug

MISCELLANEOUS

63-565	.60	Switch wafer
63-568	2.50	Switch wafer
340-8	.05/ft	Bare wire
344-16	.05/ft	Large red wire
344-56	.05/ft	Blue wire
343-12	.10/ft	Small coaxial cable
331-6	.15	Solder

ITEMS FROM PACK #6

85-345-1	1.05	Antenna Switch-board
85-346-1	1.05	RF amplifier Switch-board
85-347-1	1.05	Heterodyne oscillator Switch-board
85-348-1	1.05	Crystal Switch-board
	2.00	Manual (See front cover for part number.)

MIXER AND RTTY CIRCUIT BOARDS

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1-1	.10	47 Ω
1-3	.10	100 Ω
1-45	.10	220 Ω
1-42	.10	270 Ω
1-7	.10	680 Ω
1-9	.10	1000 Ω
1-11	.10	1500 Ω
1-44	.10	2200 Ω
1-16	.10	4700 Ω
1-73	.10	8200 Ω
1-20	.10	10 kΩ
1-21	.10	15 kΩ
1-25	.10	47 kΩ
1-47	.10	56 kΩ
1-27	.10	150 kΩ
CAPACITORS		
Mica		
20-52	.35	7.5 pF
20-160	.15	33 pF
20-113	.30	470 pF
20-122	.30	1000 μF
Ceramic		
21-3	.10	10 pF
21-46	.10	.005 μF
21-143	.20	.05 μF
Mylar		
27-73	.15	.047 μF
DIODES		
56-56	.20	1N4149 diode
56-67	1.10	Zener diode
TRANSISTORS		
417-118	.40	2N3393
417-171	.75	2N3694
417-240	2.40	40673
MISCELLANEOUS		
10-242	.55	3000 Ω linear control (3 kΩ)
10-201	.40	10 kΩ linear control
40-666	.80	Coil
45-43	.25	RF choke
52-126	16.00	LC filter
205-87	.10	RF shield
206-244	.40	Coil shield
259-20	.05	Solder pin
432-121	.10	Connector pin
434-186	.10	Board phono socket
438-4	.10	Phono plug
344-15	.05/ft	Large black wire
ITEMS FROM PACK #6		
85-351-2	1.20	Mixer circuit board
85-352-2	1.05	RTTY circuit board

IF/AUDIO CIRCUIT BOARD

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1/2-Watt		
1-129	.10	4.7 Ω
1-3	.10	100 Ω
1-137	.10	200 Ω,5%
1-42	.10	270 Ω
1-4	.10	330 Ω
1-6	.10	470 Ω
1-9	.10	1000 Ω
1-11	.10	1500 Ω
1-122	.10	3300 Ω, 5%
1-16	.10	4700 Ω
1-18	.10	5600 Ω
1-73	.10	8200 Ω
1-20	.10	10 kΩ
1-21	.10	15 kΩ
1-24	.10	33 kΩ
1-47	.10	56 kΩ
1-102	.10	82 kΩ
1-36	.10	1.5 MΩ
1-40	.10	10 MΩ
Other Resistors		
1-18-1	.10	150 Ω, 1-watt
3-6-2	.25	.51 Ω 5%,2-watt
1-20-2	.15	100 Ω, 2-watt
CONTROLS		
10-294	.35	2000 Ω (2 kΩ)
10-295	.45	750 Ω
CAPACITORS		
Ceramic		
21-78	.10	5 pF
21-25	.10	1300 pF
21-143	.20	.05 μF
Electrolytic		
25-123	.40	2 μF
25-125	.40	5 μF
25-116	.50	50 μF
25-146	.45	100 μF
25-199	.60	500 μF
Other Capacitors		
20-114	.20	270 pF mica
27-47	.20	.1 μF Mylar

PART No.	PRICE Each	DESCRIPTION
COIL-TRANSFORMERS-DIODES		
40-581	.15	620 μH fixed inductor
52-125	.95	3.395 MHz IF transformer
56-26-1	.30	1N191 diode
56-56	.20	1N4149 diode
56-33	.55	1N3754 diode
56-61	.55	Stabistor diode
TRANSISTORS		
417-100	1.50	2N3053
417-118	.40	2N3393
417-171	.75	2N3694
417-240	2.40	40673
117-9	5.00	Transistor package
Consisting of:		
417-144		MJE521
417-145		MJE371
254-22		Torque washer
HEAT SINKS-HARDWARE		
215-19	.10	Clamp heat sink
215-31	.30	TO-5 heat sink
215-39	.20	Audio heat sink
250-273	.05	4-40 x 3/8" screw
250-285	.05	4-40 x 1/4" screw
252-15	.05	4-40 nut
254-9	.05	#4 lockwasher
MISCELLANEOUS		
63-566	.60	Switch wafer (yellow dot)
75-102	.10	Insulator
352-13	.15	Silicone grease
432-124	.10	Circuit board connector
434-186	.10	Board phono socket
438-4	.10	Phono plug
490-5	.10	Nut starter
ITEMS FROM PACK #6		
204-1046	.25	Support rail
85-353-3	2.35	IF/audio circuit board

POWER SUPPLY/BFO CIRCUIT BOARD

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1/2-Watt		
1-54	.05	15 Ω, 5%
1-1	.05	47 Ω
1-3	.05	100 Ω
1-66	.10	150 Ω
1-45	.05	220 Ω
1-6	.05	470 Ω
1-79	.10	820 Ω, 5%
1-9	.05	1000 Ω
1-44	.05	2200 Ω
1-14	.05	3300 Ω
1-16	.05	4700 Ω
1-20	.05	10 kΩ
1-21	.05	15 kΩ
1-58	.10	22 kΩ, 5%
1-25	.05	47 kΩ
1-26	.05	100 kΩ
Other Resistors		
3-17-5	.20	50 Ω, 5-watt resistor
10-294	.35	2000 Ω linear control (2 kΩ)
CAPACITORS		
Mica		
20-118	.15	15 pF
20-99	.15	22 pF
20-109	.15	62 pF
20-139	.25	330 pF
20-107	.40	680 pF
Ceramic		
21-157	.10	5 pF
21-51	.10	20 pF
21-163	.05	.001 μF
21-143	.20	.05 μF
Electrolytic		
25-123	.40	2 μF
25-54	.20	10 μF
25-199	.60	500 μF
25-192	1.25	2000 μF
Other Capacitors		
27-47	.20	.1 μF Mylar
28-1	.10	2.2 pF phenolic (red-red-white)
31-57	.70	2.7 - 20 pF ceramic trimmer
29-4	.10	1800 pF polystyrene

PART No.	PRICE Each	DESCRIPTION
RF CHOKE-DIODES-INTEGRATED CIRCUIT		
45-39	.20	RF choke
56-56	.20	1N4149 diode
57-27	.50	1N2071 diode
56-67	1.10	Zener diode
443-8	2.25	MC724P integrated circuit
TRANSISTORS		
417-91	.85	2N5232A
417-85	.70	E844
417-175	1.45	2N5294
CRYSTALS		
404-43	5.00	100 kHz
404-280	5.00	3392.110 kHz
404-205	5.00	3393.6 kHz
404-206	5.00	3396.4 kHz
HARDWARE		
250-285	.05	4-40 x 1/4" screw
252-15	.05	4-40 nut
254-9	.05	#4 lockwasher
250-89	.05	6-32 x 3/8" screw
252-3	.05	6-32 nut
254-1	.05	#6 lockwasher
253-2	.05	#6 fiber shoulder washer
MISCELLANEOUS		
63-567	.70	Switch wafer
75-102	.10	Insulator
215-40	.25	Heat sink
260-56	.15	Fuse clip
421-13	.15	1/2-ampere fuse
434-186	.10	Board phono socket
432-124	.10	Circuit board connector
ITEMS FROM PACK #6		
204-1046	.25	Support rail
85-354-3	2.45	Power supply/BFO board

PLUG BOARD AND EXTENDER ACCESSORIES

PART No.	PRICE Each	DESCRIPTION
432-98	.45	Switch-board plug
432-77	.10	Switch-board connector
432-124	.10	Circuit board connector
255-108	.15	Extender block
262-24	.10	Extender pin
434-42	.10	Chassis phono socket
438-4	.10	Phono plug

PART No.	PRICE Each	DESCRIPTION
ITEMS FROM PACK #6		
85-349-1	1.05	Plug board
85-355	.95	Small extender board
85-356	2.15	Large extender board

CHASSIS

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1/2 Watt		
1-1	.10	47 Ω
1-2	.10	68 Ω
1-42	.10	270 Ω
1-9	.10	1000 Ω
5 Watt		
3-17-5	.20	50 Ω
DIODE-CONTROLS		
56-56	.20	1N4149 diode
10-34	.60	600 Ω control
19-143	1.60	500 Ω control with SPST switch
19-95	1.05	10 kΩ AUD (audio) control with SPST switch
CAPACITORS-TRAP		
28-3	.10	.56 pF phenolic capacitor
21-72	.10	.005 μF ceramic capacitor (1.4 kV line bypass)
26-74	3.40	24-194 pF variable capacitor
40-546	.60	Tuned trap

PART No.	PRICE Each	DESCRIPTION
SWITCHES		
63-563	1.35	4-position
63-564	1.65	3-position
63-569	2.65	5-position
63-572	1.00	3-position
CONNECTORS		
432-27	.40	Line cord adapter
432-76	.30	AC power socket
432-120	.10	Pin socket
432-125	.45	Circuit board plug
434-2	.10	Accessory socket
434-42	.10	Chassis phono socket
434-88	.15	Lamp socket (short bracket)
434-90	.15	Lamp socket (long bracket)
436-20	.45	Phone jack
438-4	.10	Phono plug
438-25	.50	LMO load plug
438-6	.40	Accessory plug
440-1	.20	Accessory plug cap

PART No.	PRICE Each	DESCRIPTION

GROMMETS-TERMINAL STRIPS

73-3	.10	1/2" grommet
73-2	.10	3/4" grommet
431-10	.10	3-lug terminal strip
431-11	.10	5-lug terminal strip

HARDWARE

#3 Hardware

250-251	.05	3-48 x 3/8" flat head screw
252-1	.05	3-48 nut
254-7	.05	#3 lockwasher

#4 Hardware

250-156	.05	4-40 x 1/8" setscrew
250-285	.05	4-40 x 1/4" screw
252-15	.05	4-40 nut
254-9	.05	#4 lockwasher

#6 Hardware

250-40	.05	6-32 x 1-1/2" screw
250-56	.05	6-32 x 1/4" screw
250-89	.05	6-32 x 3/8" screw
250-218	.05	6-32 x 3/8" phillips screw
250-364	.05	6-32 x 7/8" screw
250-327	.05	6-32 x 1/4" flat head screw
250-170	.05	#6 x 1/4" sheet metal screw
252-3	.05	6-32 nut
252-85	.05	6-32 speednut
253-60	.05	#6 flat washer
254-1	.05	#6 lockwasher
255-23	.05	6-32 x 15/32" tapped spacer
259-1	.05	#6 large solder lug
259-6	.05	#6 small solder lug

#8 Hardware

250-137	.05	8-32 x 3/8" screw
250-87	.05	8-32 x 3/16" screw
250-93	.05	8-32 x 1/4" setscrew
254-2	.05	#8 lockwasher
252-4	.05	8-32 nut

Control Hardware

253-36	.05	Control spring washer
252-7	.05	Control nut
253-10	.05	Control flat washer
254-5	.05	Control lockwasher
259-10	.05	Control solder lug

PART No.	PRICE Each	DESCRIPTION

SHEET METAL PARTS

90-415	12.30	Cabinet
200-556	5.30	Front chassis
200-557	2.00	Rear chassis
203-657-2	2.45	Front panel
203-656	1.60	Rear panel
100-927	2.35	Right side panel
203-735	1.40	Left side panel
100-928	1.80	Left subpanel
206-460	.80	IF shield
206-461	.50	RF shield
205-692	.30	3-position connector plate
205-693	.30	2-position connector plate
100-929	.40	Rear panel bracket
100-930	1.70	RTTY bracket
206-504	.25	Switch bracket
204-557	.10	Capacitor bracket
204-363	.10	Angle bracket

DIAL PARTS

446-40	1.20	Escutcheon
100-450	6.00	Dial drive assembly
Consisting of:		
204-553	.60	Dial-mounting bracket
100-443	1.00	Dial pointer assembly
464-30-1	.20	Plastic dial window
100-447	.50	Dial pointer drive arm
250-63	.05	3-48 x 1/8" screw
266-74	.10	Nylon spiral follower
100-445	.20	Zero set drive pulley (small)
100-449	2.50	Circular dial
100-444	.75	Dial drive pulley (large)
455-42	.95	Drive shaft bushing assembly

MISCELLANEOUS MECHANICAL

206-86	.10	Pilot lamp shield
255-59	.10	Foot spacer
261-9	.05	Foot
266-159	.40	5-position switch detent
266-160	.40	9-position switch detent
391-65	.20	SB-303 nameplate
453-90	.10	1-7/8" shaft
453-193	.30	10-3/4" shaft

PART No.	PRICE Each	DESCRIPTION
Miscellaneous Mechanical (cont'd.)		
453-194	.90	7-1/2" shaft
453-195	.95	11-3/8" shaft
455-6	.10	Bushing
455-15	.10	Shaft collar
456-7	.25	Coupling
462-175	.15	Zero set knob
462-191	.70	Small knob
462-193	1.05	Large knob
MISCELLANEOUS ELECTRICAL		
110-48	94.00	LMO (linear master oscillator)*
54-242	5.00	Power transformer
404-283	35.50	SSB crystal filter
407-99	9.85	Meter
65-29	2.50	Circuit breaker
412-20	.15	#47 pilot lamp

* The LMO is available at half-price plus postage on an exchange basis; the defective unit must be returned after replacement is received. LMO returned must be in repairable condition.

PART No.	PRICE Each	DESCRIPTION
WIRE		
89-30	1.25	Line cord
134-212	4.50	Wire harness
343-5	.10/ft	RG-62/U coaxial cable
343-12	.10/ft	RG-174/U coaxial cable
344-51	.05/ft	Brown wire
344-52	.05/ft	Red wire
344-53	.05/ft	Orange wire
344-54	.05/ft	Yellow wire
TOOLS		
490-1	.10	Large alignment tool
490-109	.10	Small alignment tool
490-85	.10	Long allen wrench
490-23	.10	Small allen wrench
490-19	.40	1/4" open-end wrench

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